SOIL SURVEY OF

Highland County, Ohio

United States Department of Agriculture
Soil Conservation Service
In cooperation with
Ohio Department of Natural Resources
Division of Lands and Soil and
Ohio Agricultural Research and
Development Center

This is a publication of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and agencies of the States, usually the Agricultural Experiment Stations. In some surveys, other Federal and local agencies also contribute. The Soil Conservation Service has leadership for the Federal part of the National Cooperative Soil Survey.

Major fieldwork for this soil survey was completed in the period 1963–69. Soil names and descriptions were approved in 1973. Unless otherwise indicated, statements in the publication refer to conditions in the county in 1973. This survey was made cooperatively by the Soil Conservation Service and the Ohio Department of Natural Resources, Division of Lands and Soil, and the Ohio Agricultural Research and Development Center. It is part of the technical assistance furnished to the Highland County Soil and Water Conservation District.

Contents

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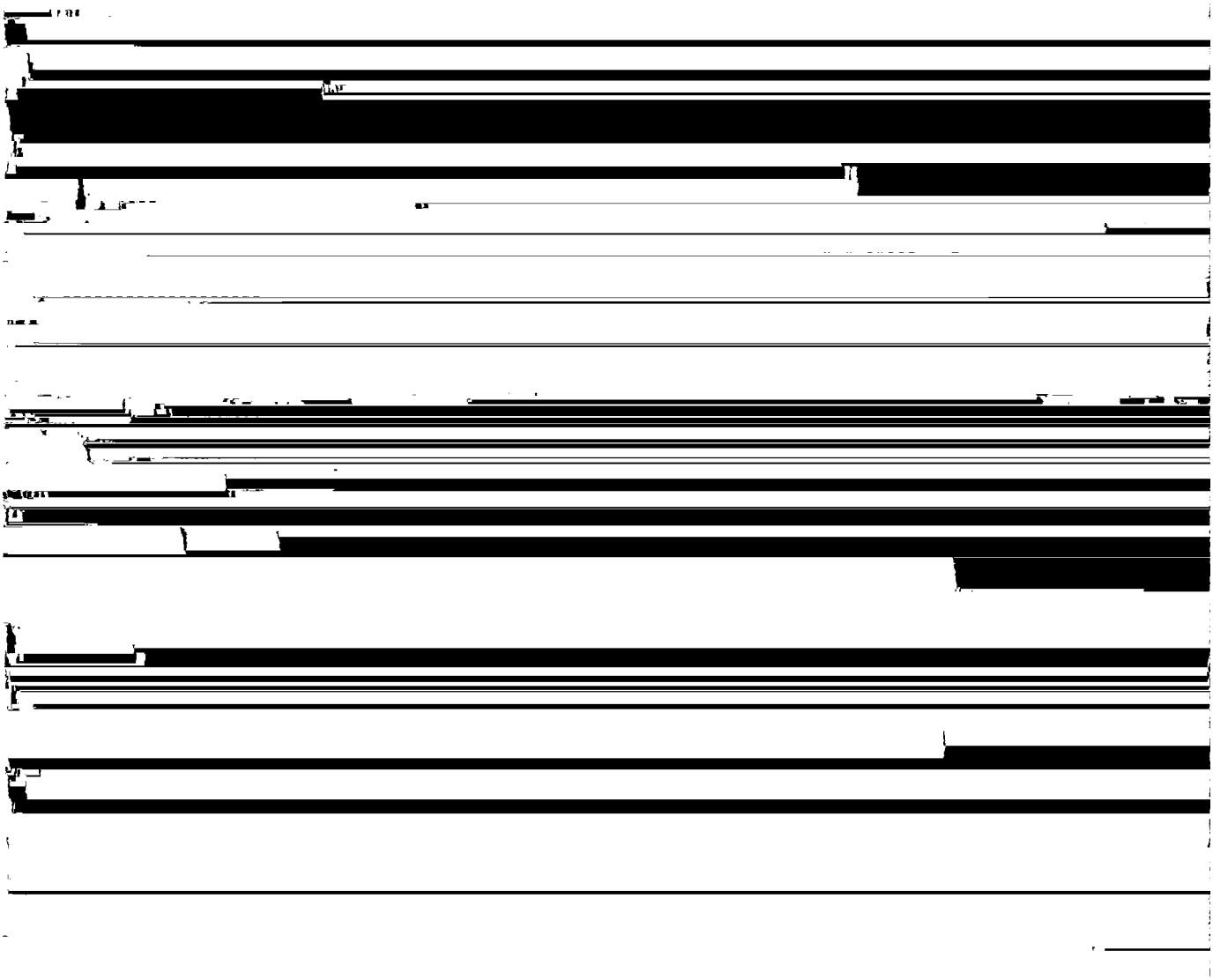
Index to Mapping Units



Summary of Tables

SOIL SURVEY OF HIGHLAND COUNTY, OHIO

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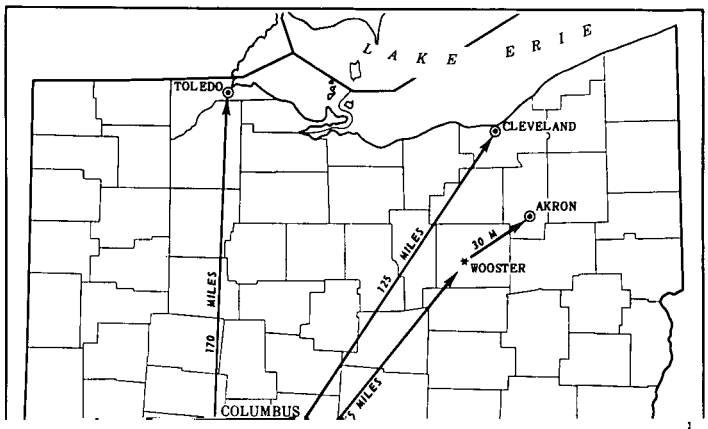
United States Department of Agriculture, Soil Conservation Service, in Cooperation With Ohio Department of Natural Resources, Division of Lands and Soil, and Ohio Agricultural Research and Development Center

HIGHLAND COUNTY is in the southwestern part of Ohio (fig. 1). It has a total land area of 549 square miles, or 351,360 acres. The population in 1970 was 28,996. Hillsboro and Greenfield are the largest towns in the



products, mainly swine, beef cattle, and dairy products. Corn, soybeans, wheat, hay, and tobacco are the principal crops. The 1967 conservation needs inventory of Highland County (*9*)[2] shows 66.5 percent of the acreage in crops, 25 percent in forest, and 6.5 percent in pasture.

The topography of Highland County ranges from nearly level on the glacial till plains in the western and northern parts of the county to steep and hilly in the unglaciated southern part. Wetness is the main soil limitation in the more nearly level areas, but controlling erosion is a main concern in farming the more sloping areas.

Recreation is a growing land use, because this county is partly near the metropolitan areas of Dayton and Cincinnati. Rocky Fork Lake, east of Hillsboro, is an important recreational center. Paint Creek Reservoir, after it has been constructed at the eastern edge of the county, is likely to be another large recreational attraction.

other geographic feature near the place where a soil of that series was first observed and mapped. Avonburg and Clermont, for example, are the names of two soil series. All the soils in the United States having the same series name are essentially alike in those characteristics that affect their behavior in the undisturbed landscape.

Soils of one series can differ in texture of the surface layer, slope, stoniness, or some other characteristics that

on a named kind of soil and they relate this failure to the high shrink-swell potential of the soil material. Thus, they use observation and knowledge of soil properties, together with available research data, to predict limitations or suitability of soils for present and potential uses.

After data have been collected and tested for the key, or benchmark, soils in a survey area, the soil scientists set up trial groups of soils. They test these groups by

soils, 10 percent Brookston soils, and 30 percent minor soils.

The dominant Miamian soils are light colored, well drained, and gently sloping to steep. Celina soils are light colored, moderately well drained, and nearly level to gently sloping. Brookston soils are dark colored, very poorly drained, and nearly level to depressional.

The minor soils in this association are light-colored, somewhat poorly drained Crosby soils and moderately well drained Cana soils. The Cana soils are underlain by acid shale bedrock at a depth of 2 to 5 feet. Other small areas of minor soils are Kendallville and Dana soils on the uplands and small areas of Eel and other soils that form in alluvium on the flood plains.

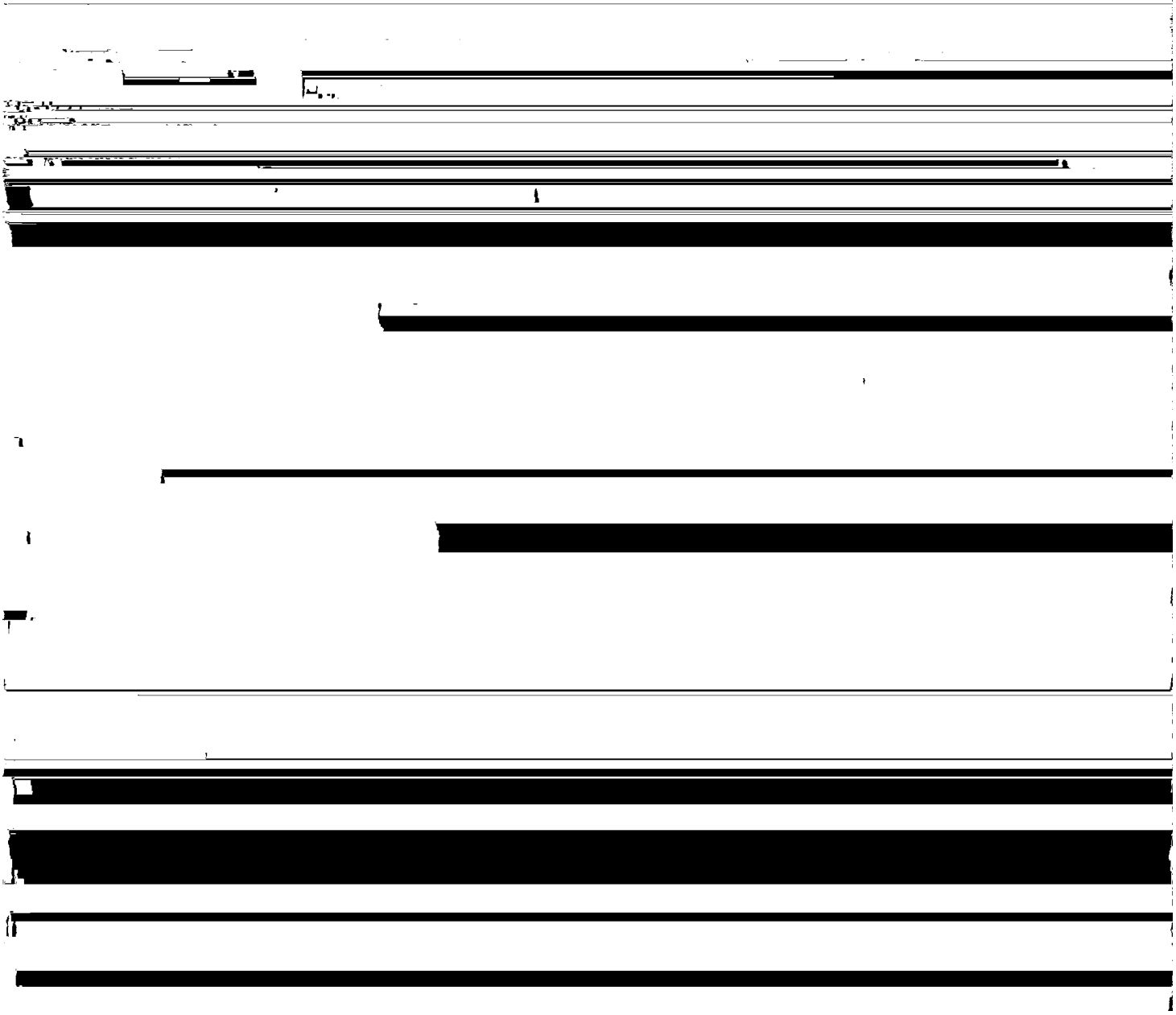
The control of erosion is the main management concern on Miamian soils and the gently sloping Celina soils. Artificial drainage is needed only in scattered wet spots. Soil wetness is the main management concern on Brookston

This association makes up about 16 percent of the county. It is about 45 percent Miamian soils, 12 percent Russell soils, 10 percent Celina soils, and 33 percent minor soils.

The dominant well-drained Miamian and Russell soils are gently sloping to steep. Celina soils are moderately well drained and nearly level to gently sloping.

Among the minor soils in this association are Xenia, Crosby, Fincastle, Brookston, and Kendallville soils. Xenia soils are moderately well drained; Crosby and Fincastle soils are somewhat poorly drained and nearly level to gently sloping; Brookston soils are dark colored and very poorly drained and generally are in depressions; and Kendallville soils are well drained and occur in hummocky areas. Other minor soils in this association are Milton and Dana soils on uplands.

Controlling erosion is the main concern in managing the dominant soils. Soil wetness is the main concern in



The heavily wooded areas have potential for recreation use, such as hiking, camping, and nature trails. Steepness and shallowness to bedrock are limitations for many nonfarm uses.

Soils That Formed Mainly in Illinoian-Age Glacial Till

These are nearly level to steep soils that formed in Illinoian-age glacial till on plains in the southern part of Highland County. They are very poorly to well drained. If farmed, these soils mostly have a moderate productivity potential. Most of the soils in this association are used for

This association makes up about 14 percent of the county. It is about 60 percent Rossmoyne soils, 20 percent Hickory soils, and 20 percent minor soils.

Rossmoyne soils are light colored, moderately well drained, and nearly level to sloping. These soils have a compact, brittle fragipan in the upper part of the subsoil and are clayey in the lower part of the subsoil extending to a depth of several feet. The Hickory soils are sloping to steep and are underlain by calcareous glacial till at depths of 18 to 45 inches.

The minor soils in this association are Cincinnati, Avonburg, Atlas, Boston, Grayford, Bratton, and Edenton soils on uplands; Fitchville and Sardinia soils on terraces;

take place and are limitations to the use of these soils for some other purposes. These soils have a moderate productivity potential if erosion control and improved soil-fertility and management practices are used. A considerable part of the nearly level to sloping acreage is used for tobacco and other cultivated crops. Most of the

9. *Colyer-Trappist-Berks association*

Shallow and moderately deep, gently sloping to very steep, well-drained soils that formed in residuum weathered from shale and sandstone

The soils of this association are in an

Loudon soils are light colored, moderately well drained, and gently sloping to steep. The depth to dense, compact shale bedrock is more than 4 feet.

The dark-colored, moderately well drained Lawshe soils are gently sloping to moderately steep areas. Dense, compact shale bedrock is generally at a depth of 2½ to 5 feet.

Among the minor soils in this association are Gasconade, Jessup, Guernsey, Beasley, Grayford, Bratton, and Boston soils.

A serious erosion hazard is the main concern of managing the soils of this association. Severe limitations to the use of these soils for many purposes and a concern if excavation and construction are planned are shallowness to bedrock; a clayey, unstable subsoil; and steepness. Soil slumping and soil creep are common occurrences on this association. Opequon soils have a low productivity potential and generally are not cultivated. A few areas of these soils have been cleared and used for pasture. The Loudon and Lawshe soils have a moderate productivity potential, and gently to moderately sloping areas of these soils are used for row crops, pasture, and some tobacco. Moderate to severe erosion in many places is the result of excessive cultivation some years ago. Dairy-

the subsoil that impedes percolation of water. The light-colored, well-drained Negley soils are underlain by sand and gravel.

Somewhat poorly drained Dubois soils and poorly drained Peoga soils are minor soils that are nearly level to depressional. Other minor soils in this association are Fox, Grayford, Rossmoyne, and Cincinnati soils on uplands and Shoals, Sloan, and other alluvial soils on flood plains.

The hazard of erosion is the main management concern for the major soils in this association if they are cultivated. Seasonal wetness is a limitation of the minor soils and the less sloping Haubstadt soils. If soil fertility is improved and erosion is controlled, Haubstadt and Otwell soils have a moderate productivity potential. Negley soils have a moderately low productivity potential.

Most of the farms in this association are general, cash grain, or dairy farms. Tobacco is a special crop. A large acreage of the steeper soils is in permanent pasture and meadow or is wooded.

Slope and moderate permeability to very slow permeability of the major soils are limitations for many nonfarm uses. Wet-season and year-round springs are common in this association. Slumping and poor soil stability are deterrents to excavation and other kinds of construction work.

practices are used in the nearly level to gently sloping areas and if erosion control practices are used in the sloping areas. The farms in this association are mostly general and cash–grain farms.

The flooding of major soils is a limitation for most nonfarm uses.

13. Fox-Genesee-Ross association

Deep, nearly level to moderately steep, well-drained soils that formed in stratified glacial outwash or recent alluvium

The soils of this association are mainly in the townships of Madison, Fairfield, and Paint in the northeastern part of the county. The areas are mainly nearly level to moderately steep, and they occur along Rattlesnake and Paint Creeks.

This association makes up about 2 percent of the county. It is about 20 percent Fox soils, 20 percent Genesee soils, 20 percent Ross soils, and 40 percent less extensive soils.

The light-colored, well-drained, nearly level to moderately steep Fox soils are on terraces. They are underlain

Some principles of management are general enough to apply to all the soils suitable for farm crops and pasture throughout the county, even though one soil or groups of soils may require different kinds of management.

On many soils in the county, lime, fertilizer, or both are needed. The amount depends on the natural supply of lime and plant nutrients as determined by the results of laboratory analyses of soil samples and on the needs of the crop. Only general suggestions for the application of lime and fertilizer are given.

Management for cultivated crops and pasture

There are wide variations in the use and management of the soils in Highland County. Field crops, pasture, and special crops are grown. Information concerning suitable crop varieties, erosion control practices, and other management practices can be obtained from the local office of the Soil Conservation Service or from the Cooperative Extension Service.

Most of the soils of Highland County were never high in

high level of pasture management provides for fertilization, control of grazing, selection of pasture seed mixtures, and other practices that are adequate to maintain good ground cover and forage for grazing. Grazing is controlled by rotating the livestock from one pasture to another and by resting the pasture after each grazing period to allow for the regrowth of plants. On some soils it is important that the pasture seed mixtures be selected so that the least amount of pasture is needed. They should also be selected for maintenance of good ground cover and forage for grazing.

Management for special crops

Special or high-value crops are important to farming in Highland County. Of these special crops, tobacco is the most important to the agriculture of the county. Among the other special crops are truck crops of sweet corn, cabbage, peppers, tomatoes, potatoes, and melons.

Xenia series can be irrigated if necessary drainage is provided.

The rest of the soils in the county are not so well suited to irrigation because they are limited by excessive slope, a slow rate of water intake, surface crusting, limited available water capacity, or somewhat poor to very poor natural drainage.

Capability Grouping

Capability grouping shows, in a general way, the suitability of soils for most kinds of field crops. The groups are made according to the limitations of the soils when used for field crops, the risk of damage when they are used, and the way they respond to treatment. The grouping does not take into account major and generally expensive landforming that would change slope, depth,

letter *e* shows that the main limitation is risk of erosion unless close-growing plant cover is maintained; *w* shows that water in or on the soil interferes with plant growth or cultivation (in some soils that wetness can be partly corrected by artificial drainage); *s* shows that the soil is limited mainly because it is shallow, droughty, or stony; and *c*, used in some parts of the United States but not in Highland County, shows that the chief limitation is climate that is too cold or too dry.

In class I there are no subclasses, because the soils of this class have few limitations. Class V can contain, at the most, only the subclasses indicated by *w*, *s*, *c*, because the soils in class V are subject to little or no erosion, though they have other limitations that restrict their use largely to pasture, woodland, wildlife, or recreation.

are also well suited to grasses, legumes, and most shrubs, vines, and trees.

CAPABILITY UNIT IIe-1

This capability unit consists of deep or moderately deep, gently sloping, well drained or moderately well drained soils on uplands or terraces.

The available water capacity is medium to high in these soils. Permeability is generally moderate to moderately slow, but it is very slow in some places. The root zone is moderately deep to deep. Some soils are moderately deep to limestone, and some have a thick surface layer. Some of these soils are moderately eroded and consequently they are more difficult to till and manage.

The main concern of management is controlling erosion. Among the other concerns are maintaining high fertility,

The soils in this unit are suited to all crops commonly grown in the county, including tobacco. They are better suited to the early maturing varieties of corn and soy-

soils. Surface ditches can also be used. Runoff from adjacent areas should be intercepted with diversions. Under optimum management these soils can be in

The main concern of management is control of flooding, which often results in soil deposition or scouring. The control of erosion is generally not a problem on these soils. The soils in this unit are suited to irrigation.

The soils in this unit are suited to tobacco and all other crops commonly grown in the county. Under optimum management, they can be row cropped intensively. Winter grain may be damaged by excess water that results from flooding or a seasonally high water table. These soils are also suited to grasses, trees, shrubs, and vines. All soils in this unit are suited to legumes, except those that have a very strongly acid rooting zone. These soils require applications of lime if legumes are to grow satisfactorily.

CAPABILITY UNIT IIs-1

This capability unit consists of deep, nearly level, well-drained soils on uplands and terraces. These soils are underlain by sand and gravel.

The available water capacity is medium to low, and permeability is moderate above a substratum of sand and gravel. These soils are some of the first soils to dry out in spring, and they may be droughty in dry years. The root zone is moderately deep.

The main management concern is conservation of moisture. Among other concerns are maintaining fertility and the content of organic matter. The content of organic matter is important because it affects the available water capacity. Erosion is generally not a concern. Soils in this unit are well suited to irrigation.

The soils in this unit are suited to tobacco and all other crops commonly grown in the county. They are better suited to early maturing varieties of corn and soybeans than to other varieties because they have a limited supply of available moisture late in summer. Under optimum management, they can be row cropped intensively. The soils are also suited to grasses, legumes,

All the soils in this unit are moderately eroded and consequently difficult to till and manage. The main management concern is controlling erosion, which is a severe hazard. Among the other management concerns are maintaining fertility, the organic-matter content, and good soil structure. Frequent use of small grains, grasses, and other close-growing crops helps in the control of erosion.

The soils in this unit are suited to most crops commonly grown in the county. Row cropping can be moderately intensive if optimum soil management is used. The soils are well suited to grasses and legumes and to most trees, shrubs, and vines.

CAPABILITY UNIT IIIe-2

This capability unit consists of deep, sloping, moderately well drained soils on uplands and terraces.

The available water capacity is medium, and permeability is moderate to slow. The root zone is moderately deep to deep. Some soils have a clayey layer in the lower part of the subsoil, and others have a firm, compact layer. Most of the soils in this unit are moderately eroded and consequently are more difficult to till and manage.

The major concern of management is controlling the erosion, which is a severe hazard. Among the other concerns are maintaining fertility, the organic matter content, and good soil structure. The soils are strongly to very strongly acid and require relatively large amounts of lime if optimum reaction is to be maintained. Row cropping can be moderately intensive if optimum management is used. Frequent use of small grain crops, grasses, and other close growing crops help in controlling erosion.

The soils in this unit are suited to most crops commonly grown in the county. They are also well suited to grasses and most trees, shrubs, and vines. If adequate amounts of lime have been applied according to the results of soil

are some of the first soils tc be dry enough in spring to till, but they tend to be droughty during dry seasons. The root zone is moderately deep or deep.

The main management concerns are conserving moisture and controlling erosion, which is a severe hazard. Among other concerns are maintaining fertility, content of organic matter, and good soil structure. The content of organic matter is important because it affects the available water capacity. Erosion cannot be adequately controlled if management is less than optimum. Frequent use of small grain crops, grasses, and other close-growing crops help in the control of erosion.

The soils in this unit are suited to most of the crops commonly grown in the county. They are better suited to early maturing varieties of corn and soybeans than to other varieties because moisture supply is limited late in summer. These soils are also suited to grasses and legumes and most trees, shrubs, and vines. Row cropping can be moderately intensive if optimum management is used. Plants that require a large amount of water should not be used.

CAPABILITY UNIT IIIe-5

This capability unit consists of deep and moderately deep, sloping, well drained or moderately well drained soils on uplands.

The available water capacity is medium to low, and permeability is moderate to slow. The root zone is moderately deep to deep.

The major management concern is controlling erosion, which is a severe hazard. Among other concerns are maintaining fertility and the content of organic matter. The soils are very strongly acid and require relatively large amounts of lime to maintain optimum reaction. Frequent use of small grain crops, grasses, and other

Excess water caused by a seasonal high water table damages winter grain crops. These soils are suited to grasses and most trees, shrubs, and vines. Because of the wetness, the trees tend to develop a shallow root system and thus are subject to windthrow. Plants that can tolerate wetness should be grown. The soils are very strongly acid, and unless lime has been applied according to the results of soil tests, plants that require a high content of lime should not be grown.

CAPABILITY UNIT IIIw-2

This capability unit consists of deep, gently sloping, somewhat poorly drained soils on uplands, slack-water terraces, and lake plains.

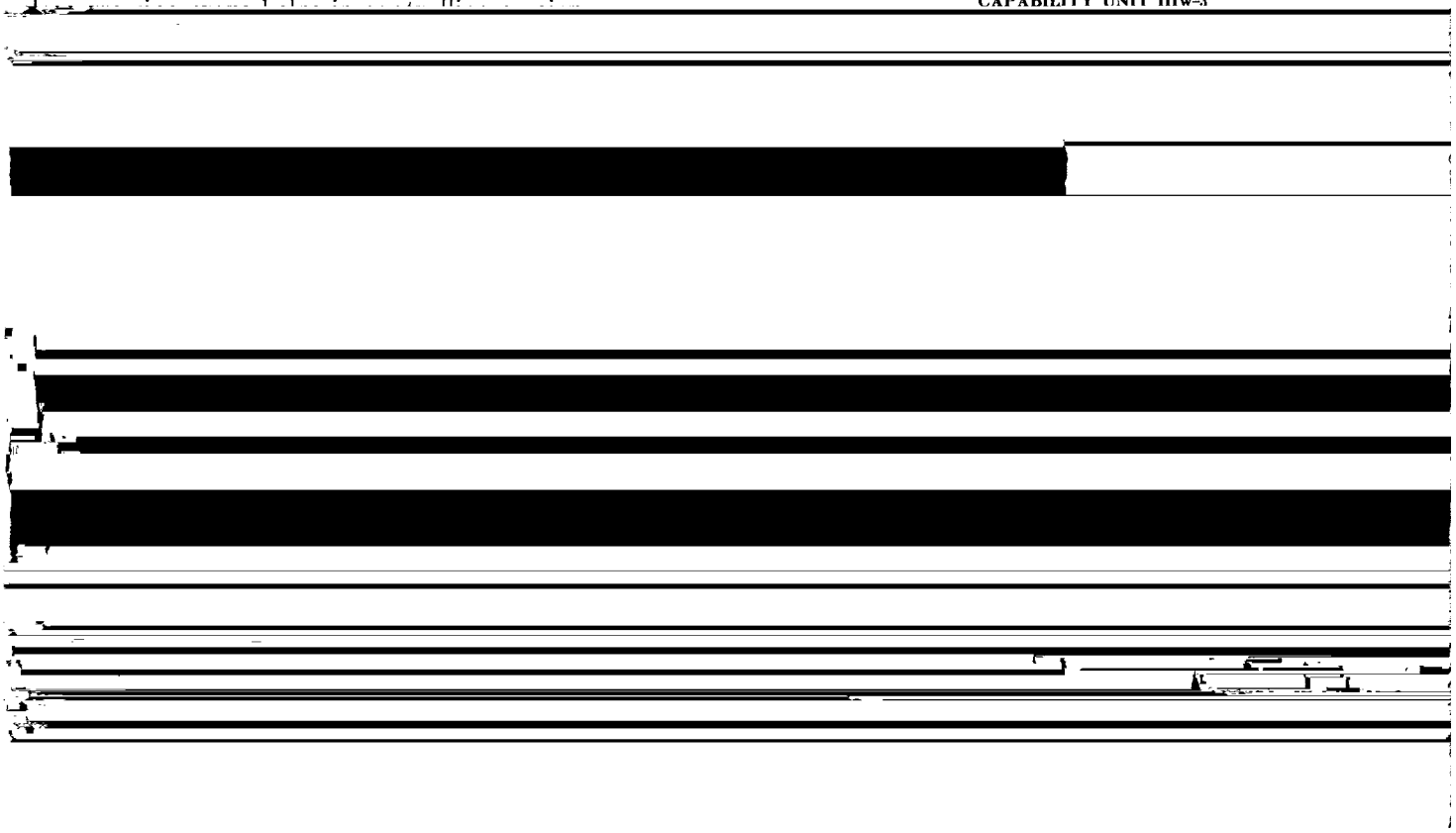
The available water table is medium, and permeability is slow to very slow. The root zone is moderately deep to deep.

The main concern of management is controlling wetness. The hazard of erosion is moderate on these soils. Among other concerns are maintaining fertility, the content of organic matter, and good soil structure.

A system of surface ditches is the most effective way of removing excess water. Standard tile systems do not work well because of the restricted soil permeability. Diversions can be used to intercept runoff from adjacent higher areas. The soils can be row cropped intensively under optimum management if erosion is controlled.

The soils in this unit are suited to most crops commonly grown in the county. Winter grain crops may be damaged by water that results from a seasonally high water table. Yields of most crops may be affected by wetness. These soils are also suited to grasses and most trees, shrubs, and vines. Only plants that tolerate wetness should be used.

CAPABILITY UNIT IIIw-3



CAPABILITY UNIT IIIw-4

This capability unit consists of nearly level, deep, poorly drained soils on uplands and lake plains.

The available water capacity is medium, and permeability is very slow to slow. The root zone is moderately deep to deep.

The main concern of management is controlling wetness. Among other concerns are maintaining fertility, the content of organic matter, and good soil structure.

These soils can be drained with tile, but the tile must be closely spaced. Surface drainage and diversions are commonly used. Because these soils are medium acid to very strongly acid, they require relatively large amounts of lime for the growing of most crops. Under optimum management, the soils can be row cropped intensively. If less than optimum management is used, intensive row cropping can increase wetness by destroying organic matter and soil structure. Erosion is generally not a prob-

slow to slow. The root zone is moderately deep. Most of these soils have a firm compact layer or fragipan in the subsoil.

The main management concern is controlling the erosion, which is a very severe hazard. Among other concerns are maintaining fertility, the content of organic matter, and good soil structure. Because these soils are moderately and severely eroded and consequently have a more clayey surface layer, they are more difficult to till and manage. The soils can be tilled only within a narrow range of moisture content. They become compact and cloddy if they are worked when too wet. Because these soils are medium acid to very strongly acid, they require relatively large amounts of lime to maintain an adequate reaction. Under optimum management, these soils can be row cropped occasionally, but if management is less than optimum, erosion cannot be adequately controlled in

[redacted]

These soils are not suited to row crops, because of slope, stoniness, and erosion, which is a very severe hazard. They are suited to permanent pasture and woodland as well as to most grasses, trees, shrubs, and vines commonly grown in the county. The soils are suited to legumes commonly grown for permanent pasture if adequate lime has been applied according to the results of soils tests. Grazing should be regulated to maintain sufficient cover for erosion control.

CAPABILITY UNIT VIs-1

This capability unit consists of shallow to moderately deep, moderately steep to very steep, well-drained soils on the uplands.

The availabile water capacity is low to medium, and permeability is moderately rapid to slow. The root zone is shallow to moderately deep. In many areas there are numerous stone or shale fragments on the surface and throughout the soil.

These soils are not suited to cultivation, because of soil depth, degree of slope, stoniness, and erosion, which is a very severe hazard. The areas that can be fertilized, seeded, and mowed are suitable for pasture. The carrying capacity of pasture is low, particularly during dry seasons. Some areas are best suited to woodland.

CAPABILITY UNIT VIIe-1

This capability unit consists of deep, steep to very steep, well-drained soils on uplands, terraces, and kames.

The available water capacity is generally low, and permeability is moderately slow to moderately rapid. The root zone is shallow to moderately deep.

Most of these soils are too shallow and all are too steep for cultivation. Because the hazard of erosion is very severe the use of these soils for permanent vegetation is limited. Areas that can be fertilized, seeded, and mowed are suitable for pasture. These soils are suited to grasses and legumes commonly grown in the county for permanent pasture, but plant growth may be affected by limited available soil water. Areas that are too steep or rough for pasture are better suited to woodland.

CAPABILITY UNIT VIIe-2

This capability unit consists of moderately deep to deep, very steep, well-drained soils on uplands.

The available water capacity is low to medium, and permeability is moderate to moderately rapid. The root zone is moderately deep to deep. The soils are underlain by acid sandstone, and bedrock outcrops are common. There are stone fragments on the surface and throughout the soils.

On the soils in this unit, erosion is a very severe hazard. The soils are too stony and too steep for cultivation. Operating modern farm machinery on these soils is not safe. The use of these soils is limited to permanent vegetation. These soils have limited suitability for pasture but are generally better suited to woodland. They are suited to most trees that commonly are in the county.

CAPABILITY UNIT VIIs-1

This capability unit consists of shallow to moderately deep, very steep, well-drained soils on uplands.

The available water capacity is low to medium, and permeability is moderate to slow. The root zone is very shallow to moderately deep. There are many stone fragments on the surface and throughout the soil. Bedrock outcrops are common.

All of these soils are too steep, and most of them are too shallow and stony for cultivation. They are poorly suited to pasture. The soils are suited for woodland and wildlife if optimum management is used.

Estimated Yields

Table 1 shows, for most of the soils in the county, the estimated average acre yields of principal crops. The yields are the averages of those expected over a period of several years under two levels of management. Some of the soils are not listed because they are not suited to the crops rated. Also excluded are land types, such as Urban land.

The estimates of yields given in table 1 are based mainly on information obtained from farmers and on observations and field trials made by the county agent and district conservationists of the Soil Conservation Service. They are also based on experiments made by the Ohio Agricultural Research and Development Center and on field observations made by members of the soil survey party.

In table 1, yields in columns A are obtained under improved management and those in columns B are obtained under optimum management. Under an optimum level of management:

1. Practices are used that increase the intake of water and the water-holding capacity of the soils. Excess water is disposed of by appropriate means.
2. Practices are used to help control erosion.
3. Suitable methods of plowing, preparing the seedbed, and cultivation are used.
4. Weeds, diseases, and insects are controlled.
5. Fertility is maintained at the highest level. Lime and fertilizer are applied according to needs of the soil and crop. The fertilizer contains trace elements (zinc, cobalt, manganese, copper, and the like) if they are needed.
6. Crop varieties that are suited to the soil are selected.
7. All farming operations are done at the proper time and in the proper way.

In an improved level of management the farmer uses some, but not all, of the practices listed under optimum management, or the practices used are not adequate for the needs of the crops.

The yields given in table 1 do not apply to a specific field for any particular year, because the soils vary from place to place, management practices vary from farm to farm, and weather conditions are variable from year to year.

These yields are intended only as a guide that shows relative productivity of the soils, the response of soils to management, and the relationship of soils to each other. Although the general level of crop yields may change as new methods and new crop varieties are developed, the relationship of the soils to each other is not likely to change.

TABLE 1.—*Estimated average yields per acre of principal crops under two levels of management*

[Yields in columns A are based on improved management, and those in columns B are based on optimum management. See the text for definitions of those levels of management. Dashes indicate that the soil is not suited to the particular crop or that the crop is not commonly grown on the soil. Soils that are not suited to the crops in the table are not listed. Urban land also is not listed]

Soil	Corn		Soybeans		Wheat		Grass-legume hay	
	A	B	A	B	A	B	A	B
	Bu	*Bu*	*Bu*	*Bu*	*Bu*	*Bu*	*Tons*	*Tons*
Algiers silt loam	105	125	30	40	34	44	3.0	5.0
Atlas silt loam, 2 to 6 percent slopes	70	110	26	36	30	42	2.8	4.0
Atlas silt loam, 2 to 6 percent slopes, moderately eroded	65	100	24	34	28	38	2.8	4.0
Atlas silt loam, 6 to 12 percent slopes, moderately eroded	60	95	---	---	26	36	2.6	3.8
Atlas silt loam, 6 to 12 percent slopes, severely eroded	---	---	---	---	22	30	2.4	3.4
Avonburg silt loam, 0 to 2 percent slopes	75	110	26	36	32	44	2.8	4.0
Avonburg silt loam, 2 to 6 percent slopes	70	110	26	36	30	42	2.8	4.0
Beasley silt loam, 6 to 12 percent slopes, moderately eroded	60	75	---	---	28	36	2.8	3.6
Beasley silt loam, 12 to 18 percent slopes, moderately eroded	---	---	---	---	24	30	2.6	3.2
Berks-Muskingum channery silt loams, 18 to 35 percent slopes							2.0	2.6

TABLE 1.—*Estimated average yields per acre of principal crops under two levels of management*—Continued

[Yields in columns A are based on improved management, and those in columns B are based on optimum management. See the text for definitions of those levels of management. Dashes indicate that the soil is not suited to the particular crop or that the crop is not commonly grown on the soil. Soils that are not suited to the crops in the table are not listed. Urban land also is not listed]

Soil	Corn		Soybeans		Wheat		Grass-legume hay	
	A	B	A	B	A	B	A	B
	Bu	*Bu*	*Bu*	*Bu*	*Bu*	*Bu*	*Tons*	*Tons*
Fox clay loam, 6 to 12 percent slopes, severely eroded					22	32	2.6	3.8
Gasconade silty clay loam, 6 to 12 percent slopes							1.8	2.8
Gasconade silty clay loam, 12 to 18 percent slopes, moderately eroded							1.6	2.6
Genesee silt loam	90	130	36	46	30	46	3.8	5.2
Guernsey silt loam, 2 to 6 percent slopes	85	100			26	36	3.0	4.0
Guernsey silt loam, 6 to 12 percent slopes	80	90			26	36	2.8	4.0
Guernsey silty clay loam, 6 to 12 percent slopes, severely eroded							2.0	2.8
Guernsey soils, 12 to 18 percent slopes, severely eroded							2.0	2.8
Haubstadt silt loam, 0 to 2 percent slopes	85	110	24	34	30	40	2.4	4.4
Haubstadt silt loam, 2 to 6 percent slopes	85	110	24	34	30	40	3.4	4.4
Haubstadt silt loam, 6 to 12 percent slopes, moderately eroded	80	90			22	30	3.2	4.2
Haubstadt silt loam, 6 to 12 percent slopes, severely eroded	60	70			14	20	2.0	3.2
Haubstadt silt loam, 12 to 18 percent slopes, moderately eroded							2.4	3.4
Haubstadt silt loam, 12 to 18 percent slopes, severely eroded							1.8	3.0
Hickory silt loam, 6 to 12 percent slopes, moderately eroded	65	85			22	30	2.8	3.8
Hickory silt loam, 12 to 18 percent slopes, moderately eroded							2.4	3.4
Hickory silt loam, 18 to 25 percent slopes, moderately eroded							2.2	3.2
Hickory clay loam, 6 to 12 percent slopes, severely eroded	50	60			18	24	2.2	3.2
Hickory clay loam, 12 to 18 percent slopes, severely eroded							2.0	3.0
Jessup silt loam, 12 to 18 percent slopes							2.6	3.6
Johnsburg silt loam, 2 to 8 percent slopes	60	85	18	28	20	36	2.8	3.8
Kendallville silt loam, 2 to 6 percent slopes	90	110	26	36	36	46	3.5	4.5
Kendallville silt loam, 6 to 12 percent slopes, moderately eroded	80	105	22	32	30	40	3.0	4.0
Kendallville silt loam, 12 to 18 percent slopes, moderately eroded							2.6	3.6
Kendallville clay loam, 12 to 18 percent slopes, severely								

TABLE 1.—*Estimated average yields per acre of principal crops under two levels of management*—Continued

[Yields in columns A are based on improved management, and those in columns B are based on optimum management. See the text for definitions of those levels of management. Dashes indicate that the soil is not suited to the particular crop or that the crop is not commonly grown on the soil. Soils that are not suited to the crops in the table are not listed. Urban land also is not listed]

Soil	Corn		Soybeans		Wheat		Grass-legume hay	
	A	B	A	B	A	B	A	B
	Bu	*Bu*	*Bu*	*Bu*	*Bu*	*Bu*	*Tons*	*Tons*
Milton silt loam, 12 to 18 percent slopes, moderately eroded							2.2	2.4
Milton clay loam, 6 to 12 percent slopes, severely eroded							2.0	2.4
Montgomery silty clay loam	95	110	32	38	32	44	3.8	4.8
Negley loam, 6 to 12 percent slopes	70	90			28	36	2.0	3.0
Negley loam, 12 to 18 percent slopes							1.8	2.8
Negley silt loam, 2 to 6 percent slopes	85	100	26	36	30	40	2.4	3.4
Negley clay loam, 6 to 12 percent slopes, severely eroded	50	60			20	30	1.4	2.2
Negley clay loam, 12 to 18 percent slopes, severely eroded							1.6	2.0
Nicholson silt loam, 2 to 6 percent slopes	70	100	26	40	30	42	3.2	4.4
Nicholson silt loam, 2 to 6 percent slopes, moderately eroded	65	95	24	38	28	40	3.0	4.2
Nicholson silt loam, 6 to 12 percent slopes, moderately eroded	65	95			24	38	2.8	4.0
Ockley silt loam, 0 to 2 percent slopes	90	110	30	46	36	46	3.2	4.6
Ockley silt loam, 2 to 6 percent slopes	90	105	28	44	36	46	3.2	4.6
Ockley silt loam, 6 to 12 percent slopes, moderately eroded	85	95	26	40	34	44	3.0	4.4
Opequon silt loam, 6 to 18 percent slopes, moderately eroded							1.5	2.5
Opequon clay loam, 6 to 18 percent slopes, severely eroded							1.2	2.0
Otwell silt loam, 2 to 6 percent slopes	85	95	28	32	30	38	3.0	4.0
Otwell silt loam, 6 to 12 percent slopes, moderately eroded	80	90			28	36	3.0	3.8

Use of the Soils for Woodland [3]

In the early settlement of Highland County, it was necessary to remove the virgin forest which covered the county. Today mostly regrowth forest occupies approximately 84,000 acres, or about 25 percent of the total land area in Highland County. Much of this acreage has been or is being pastured. Very little regrowth or reforestation is occurring in the pastured woodland. The proximity of metropolitan areas makes the development of outdoor open space for income-producing recreational use a practical consideration. Woodland, potentially a multiple use resource, looms even larger in importance when viewed in this context.

Much can be said about the natural beauty of the county because of its woodland. Native redbud and dogwood bloom in the spring and present a panorama of natural beauty. The steep hillsides, winding streams, and narrow township roads come alive with color in autumn as the sweetgum, maple, dogwood, and sassafras seem to blaze with many hues of red, yellow, and brown.

Highland County is within the north-central hardwood forest region. Species such as black and red oaks, pin and white oaks, ash, beech, and sugar maple grow throughout the county.

Beech-maple is the dominant forest type and grows on the better drained soils. Associated species are yellow-poplar, white ash, white oak, red maple, basswood, wild cherry, sweetgum, sassafras, pin oak, and shagbark hickory.

The oak-hickory and beech-maple forest types are represented [illegible]

similar management, and have the same potential production for wood crops.

Each woodland group is identified by a three-part symbol, such as 1o1, 2w1, or 3c2. The potential productivity of the soils in the group is indicated by the first number in the symbol: 1 and 2—good; 3—fair; 4 and 5—poor. These average ratings are based on field measurements of tree site index for principal soils within each group. Site index of a given soil is the height, in feet, that the dominant and codominant trees of a given species reach in a natural, undisturbed stand in 50 years. Other publications give a more complete discussion of site index and potential productivity (*5*, *7*, *8*, *11*).

The second part of the symbol identifying a woodland group is a small letter *x*, *w*, *d*, *c*, *f*, *r*, or *o*. The small letter indicates an important soil property that imposes a hazard or limitation in managing the soils of the group for trees. The letter *x* shows that the soils have limitations because of stoniness. The letter *w* means excessive wetness, either seasonal or all year. The letter *d* shows that the main limitation is restricted rooting depth. The letter *c* stands for clayey soils. The letter *f* shows that the soils have limitations of available water capacity due to large amounts of coarse fragments within the soil profile. The letter *r* shows that the main limitation is steep slopes and that there is a hazard of erosion and possible limitations to use of equipment. The letter *o* indicates few, if any, limitations that restrict use of the soils for trees. Priority in assigning the small letters designating the limiting features is in the order that the letters are listed above.

The last part of the symbol, another number, dif-

TABLE 2.— *Woodland*

Woodland suitability group	Potential productivity			Hazards and limitations that affect management		
	Rating	Kinds of trees	Site index[1]	Erosion hazard	Equipment limitations	Seedling mortailty
			Ft			
Group 1o1	Good	Upland oak Yellow-poplar Sugar maple	85+ 95+ 85+	Slight	Slight	Slight
Group 2o1	Good	Upland oak	75–85	Slight	Slight	Slight
Group 2r1	Good	Upland oak	75–85	Moderate	Moderate	Slight
Group 2c1	Good	Upland oak	75–85	Slight	Moderate	Slight
Group 2c2	Good	Upland oak	75–85	Severe	Severe	Moderate
Group 2w1	Good	Wetland oak	80–90	Slight	Severe	Severe
Group 2w2	Good	Wetland oak Upland oak Yellow-poplar Sugar maple	80–90 75–85 85–95 75–85	Moderate	Moderate	Moderate

interpretations

Hazards and limitations that affect management—Con.			Trees to favor in existing stands	Suitable trees for planting
Plant competition		Windthrow hazard		
Conifers	Hardwoods			
Severe	Moderate	Slight	Red oak, white oak, black oak, yellow-poplar, black walnut, sugar maple, white ash, eastern white pine.	Black walnut, yellow-poplar, white ash, eastern white pine, Norway spruce.
Severe	Moderate	Slight	Black walnut, yellow-poplar, northern red oak, white oak.	Black walnut, yellow-poplar, eastern white pine.
Severe	Moderate	Slight	Black walnut, yellow-poplar, northern red oak, white oak, Virginia pine.	Black walnut, yellow-poplar, eastern white pine, Virginia pine.
Severe	Moderate	Slight	Yellow-poplar, black walnut, northern red oak, white oak, white ash.	Black walnut, tulip poplar, eastern white pine.
Severe	Moderate	Slight	Yellow-poplar, black walnut, northern red oak, white oak, white ash.	Yellow-poplar, black walnut, eastern white pine.
Severe	Severe	Severe	White ash, red maple, bur oak, swamp white oak, pin oak, sycamore.	White ash, red maple, cottonwood, sycamore.
Severe	Severe	Moderate	Northern red oak, swamp white oak, white ash, sycamore.	Cottonwood, sycamore, white ash.
Severe	Severe	Slight	Northern red oak, yellow-poplar, white ash, red maple.	Eastern white pine, yellow-poplar Virginia pine.
Moderate	Slight	Slight	Northern red oak, white oak, yellow-poplar, black walnut.	White pine, yellow-poplar, Virginia pine.
Moderate	Slight	Slight	Northern red oak, white oak, yellow-poplar, black walnut, chesnut oak.	Eastern white pine, Virginia pine, yellow-poplar.
Moderate	Slight	Slight	White oak, black oak, chesnut oak, Virginia pine.	Virginia pine.
Moderate	Slight	Slight	Northern red oak, white oak, black oak, yellow-poplar.	Eastern white pine, Virginia pine, tulip-poplar.
Moderate	Slight	Slight	Northern red oak, white oak, black oak, yellow-poplar, chesnut oak.	Virginia pine, eastern white pine, yellow-poplar.
Moderate	Slight	Slight	Northern red oak, white oak, black walnut, red maple.	Eastern white pine, yellow-poplar, white ash.
Moderate	Slight	Slight	White oak, northern red oak, black oak, chestnut oak, Virginia pine.	Eastern white pine, Virginia pine.
Slight	Slight	Slight	Red oak, white oak, chestnut oak	Eastern white pine, Virginia pine.
Slight	Slight	Slight	Northern red oak, white oak, chestnut oak.	Eastern white pine, Virginia pine.
Slight	Slight	Moderate	Black oak, white oak, chestnut oak.	Eastern redcedar, shortleaf pine, Vir-

TABLE 2.—*Woodland*

	Potential productivity			Hazards and limitations that affect management		
Woodland suitability group						

interpretations—Continued

Hazards and limitations that affect management—Con.			Trees to favor in existing stands	Suitable trees for planting
Plant competition		Windthrow hazard		
Conifers	Hardwoods			
Slight	Slight	Moderate	White oak, chestnut oak, shortleaf pine, Virginia pine.	Eastern redcedar, shortleaf pine, Virginia pine.
Moderate	Slight	Moderate	Sycamore, sweetgum, cottonwood, red maple.	Sycamore, sweetgum, cottonwood, red maple.
Slight	Slight	Slight	White oak, chestnut oak, shortleaf pine, Virginia pine.	Shortleaf pine, Virginia pine.
Slight	Slight	Slight	Shortleaf pine, Virginia pine	Shortleaf pine, Virginia pine.

capacity, natural drainage, slopes, surface stoniness, hazard of flooding, and texture of the surface layer.

Wild herbaceous plants.—In this group are native or introduced perennial grasses and weeds that generally are established naturally. They include bluestem, quackgrass, panicgrass, goldenrod, wild carrot, nightshade, and dandelion. They provide food and cover principally to upland forms of wildlife. The major soil properties affecting this habitat element are effective rooting depth, available water capacity, natural drainage, surface stoniness, hazard of flooding or ponding, and texture of the surface layer.

Hardwood trees.—These plants are nonconiferous trees, shrubs, and woody vines that produce nuts or other fruits, buds, catkins, twigs, or foliage that wildlife eat. They are generally established naturally, but may be planted. Among the native kinds are oak, cherry, maple, poplar, apple, hawthorn, dogwood, persimmon, sumac, sassafras, hazelnut, black walnut, hickory, sweetgum, bayberry, blueberry, huckleberry, blackhaw, virburnum, grape, and briers. The major soil properties affecting this habitat element are effective rooting depth, available water capacity, and natural drainage.

Also in this group are several varieties of fruiting shrubs that are raised commercially for planting. Autumnolive, Amur honeysuckle, Tatarian honeysuckle, crabapple, multiflora rose, highbush cranberry, and silky dogwood are some of the shrubs that generally are available and can be planted on soils that are rated well suited. Hardwoods that are not available commercially can commonly be transplanted successfully.

Wetland plants.—Making up this group are wild, herbaceous, annual and perennial plants that grow on moist to wet sites exclusive of submerged or floating aquatics. They produce food and cover extensively used mainly by wetland forms of wildlife. They include smartweed, wild millet, bulrush, sedges, barnyardgrass, pondweed, duckweed, duckmillet, arrowarum, pickerelweed, waterwillow, wetland grasses, wildrice, and cattails. The major soil properties affecting this habitat element are natural drainage, surface stoniness, slope, and texture of the surface layer.

Shallow water areas.—These are areas of surface water with average depth of less than 5 feet, useful to wildlife. They may be natural wet areas or those created by dams or levees or by water-control devices in marshes or streams. Examples are muskrat marshes, waterfowl feeding areas, wildlife water developments, wildlife ponds, and beaver ponding. The major soil properties affecting this habitat element are depth to bedrock, natural drainage, slope, permeability, and surface stoniness or rockiness.

Table 3 rates the soils according to their suitability for three classes of wildlife in the county—openland, woodland, and wetland wildlife.

Openland wildlife.—Examples of openland wildlife are quail, pheasant, meadowlark, field sparrow, dove, cottontail rabbit, red fox, and woodchuck. These birds and mammals normally make their home in areas of cropland, pasture, meadow, and lawns in areas overgrown with grasses, herbs, and shrubs.

Woodland wildlife.—Among the birds and mammals that prefer woodland are woodcock, thrush, vireo, scarlet tanager, gray and fox squirrels, gray fox, white-tailed deer, raccoon, and opossum. They obtain food and cover in stands of hardwoods, coniferous trees, shrubs, or a mixture of these plants.

Wetland wildlife.—Ducks, geese, rails, herons, shore birds, mink, and muskrat are familiar examples of birds and mammals that normally make their home in wet areas, such as ponds, marshes, and swamps.

Each rating under "Kinds of wildlife" in table 3 is based on the ratings listed for the habitat elements in the first part of the table. For openland wildlife the rating is based on the ratings shown for grain and seed crops, grasses and legumes, wild herbaceous plants, and hardwood trees. The rating for woodland wildlife is based on the ratings listed for grasses and legumes, wild herbaceous plants, and hardwood trees. For wetland wildlife the rating is based on the ratings shown for wetland plants and shallow water areas.

TABLE 3.—*Suitability of the soils for elements*

[Avonburg-Urban land complex (AxA), Boston-Urban land complexes (BoB and BoC), Celina-Urban land complex (CfB), Crosby-Urban (OdB), and Rossmoyne-Urban land

Soil series and map symbols	Wildlife habitat elements		
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants
Algiers: Ag	Fair	Good	Good
Atlas:			
AtB, AtB2	Fair	Good	Good
AtC2, AtC3	Fair	Good	Good
Avonburg:			
AvA	Fair	Good	Good
AvB	Fair	Good	Good
Beasley:			
BeC2	Fair	Good	Good
BeD2	Poor	Fair	Good
Berks:			
BhD.			
Berks and Muskingum parts	Fair	Good	Good
Neotoma part	Fair	Good	Good
BgF, BhF.			
Berks and Muskingum parts	Very poor	Fair	Good
Neotoma part of BhF	Very poor	Fair	Good
BgG, BhG.			
Berks and Muskingum parts	Very poor	Poor	Good
Neotoma part of BhG	Very poor	Poor	Good
Blanchester: Bk	Poor	Fair	Fair
Boston:			
BmC2, BmC3	Fair	Good	Good
BmD2, BmD3, BmE2	Poor	Fair	Good
BnB, BnB2	Good	Good	Good
Bratton:			
BpB, BpB2	Fair	Good	Good
BpC2	Fair	Good	Good
BpD2, BrD3	Poor	Fair	Good
Brookston: Bs, Bt	Fair	Poor	Poor
Cana:			
CaB	Good	Good	Good
CaC2	Fair	Good	Good
CaD2	Poor	Fair	Good
CaF	Very poor	Fair	Good
Casco:			
CcD3	Poor	Fair	Good
CcF2	Very poor	Fair	Good
Celina:			
CeB	Good	Good	Good
CgA	Good	Good	Good
CgB	Good	Good	Good
Cincinnati:			
ChB	Good	Good	Good
ChC2	Fair	Good	Good
ChD2	Poor	Fair	Good
Clermont: Cm	Poor	Fair	Fair

of wildlife habitat and kinds of wildlife

land complex (CuA), Haubstadt-Urban land complexes (HcB and HcC), Miamian-Urban land complex (MsB), Ockley-Urban complex complex (RtB) are not rated in this table]

Wildlife habitat elements—Continued			Kinds of wildlife		
Hardwood trees	Wetland plants	Shallow water areas	Openland	Woodland	Wetland

TABLE 3.—*Suitability of the soils for elements*

Soil series and map symbols	Wildlife habitat elements		
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants
Colyer:			
CoD2.			
Colyer part	Poor	Poor	Fair
Trappist part	Poor	Fair	Good
CoF.			
Colyer part	Very poor	Poor	Fair
Trappist part	Very poor	Fair	Good
CoG.			
Colyer part	Very poor	Poor	Fair
Trappist part	Very poor	Poor	Good
Crosby:			
CrA	Fair	Good	Good
CsA	Fair	Good	Good
CsB	Fair	Good	Good
Dana:			
DaA	Good	Good	Good
DaB	Good	Good	Good
Dubois:			
DuA	Fair	Good	Good
DuB	Fair	Good	Good
Edenton:			
EbC2	Fair	Good	Good
EbD2	Poor	Fair	Good
EbF2	Very poor	Fair	Good
Eel: Ee	Fair	Good	Good
Fitchville:			
FcA	Fair	Good	Good
FcB	Fair	Good	Good
Fox:			
FlC2, FoC3	Fair	Good	Good
FlD2	Poor	Fair	Good
FnA, FnB	Good	Good	Good
Gasconade: GaC, GaD2, GbF2, GbG	Poor	Poor	Poor
Genesee: Gn	Fair	Good	Good
Guernsey:			
GuB	Good	Good	Good
GuC, GvC3	Fair	Good	Good
GxD3	Poor	Fair	Good
Haubstadt:			
HbA	Good	Good	Good
HbB	Good	Good	Good
HbC2, HbC3	Fair	Good	Good
HbD2, HbD3	Poor	Fair	Good
Hennepin:			
HeF2	Very poor	Fair	Good
HeG2	Very poor	Poor	Good
HfE3	Poor	Fair	Good
Hickory:			
HkC2, HyC3	Fair	Good	Good
HkD2, HyD3, HkE2, HyE3	Poor	Fair	Good
HkF2	Very poor	Fair	Good
Jessup: JeD	Poor	Fair	Good
Johnsburg: JoC	Fair	Good	Good

of wildlife habitat and kinds of wildlife—Continued

Wildlife habitat elements—Continued			Kinds of wildlife		
Hardwood trees	Wetland plants	Shallow water areas	Openland	Woodland	Wetland
Poor	Very poor	Very poor	Poor	Poor	Very poor.
Good	Very poor	Very poor	Fair	Good	Very poor.
Poor	Very poor	Very poor	Poor	Poor	Very poor.
Good	Very poor	Very poor	Fair	Good	Very poor.
Poor	Very poor	Very poor	Poor	Poor	Very poor.
Good	Very poor	Very poor	Poor	Good	Very poor.
Good	Fair	Fair	Good	Good	Fair.
Good	Fair	Fair	Good	Good	Fair.
Good	Poor	Very poor	Good	Good	Very poor.
Good	Poor	Poor	Good	Good	Poor.
Good	Poor	Very poor	Good	Good	Very poor.
Good	Fair	Fair	Good	Good	Fair.
Good	Poor	Very poor	Good	Good	Very poor.
Good	Very poor	Very poor	Good	Good	Very poor.
Good	Very poor	Very poor	Fair	Good	Very poor.
Good	Very poor	Very poor	Fair	Good	Very poor.
Good	Poor	Poor	Good	Good	Poor.
Good	Fair	Fair	Good	Good	Fair.
Good	Poor	Very poor	Good	Good	Very poor.
Good	Very poor	Very poor	Fair	Good	Very poor.
Good	Very poor	Very poor	Fair	Good	Very poor.
Good	Poor	Very poor	Good	Good	Very poor.
Poor	Very poor	Very poor	Poor	Poor	Very poor.
Good	Poor	Very poor	Good	Good	Very poor.
Good	Poor	Very poor	Good	Good	Very poor.
Good	Very poor	Very poor	Good	Good	Very poor.
Good	Very poor	Very poor	Fair	Good	Very poor.
Good	Poor	Poor	Good	Good	Poor.
Good	Poor	Very poor	Good	Good	Very poor.
Good	Very poor	Very poor	Good	Good	Very poor.
Good	Very poor	Very poor	Fair	Good	Very poor.
Good	Very poor	Very poor	Fair	Good	Very poor.
Good	Very poor	Very poor	Poor	Good	Very poor.
Good	Very poor	Very poor	Fair	Good	Very poor.
Good	Very poor	Very poor	Good	Good	Very poor.
Good	Very poor	Very poor	Fair	Good	Very poor.
Good	Very poor	Very poor	Fair	Good	Very poor.
Good	Very poor	Very poor	Fair	Good	Very poor.
Good	Poor	Very poor	Good	Good	Very poor.

TABLE 3.—*Suitability of the soils for elements*

Soil series and map symbols	Wildlife habitat elements		
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants
Kendallville:			
KeB	Good	Good	Good
KeC2	Good	Good	Good
KeD2, KfD3	Poor	Fair	Good
Lawshe:			
LhB	Good	Good	Good
LhC2	Fair	Good	Good
LhD2, LlD3	Poor	Fair	Good
Loudon:			
LoB, LoB2	Good	Good	Good
LoC2	Fair	Good	Good
LoD2	Poor	Fair	Good
LoE2	Poor	Fair	Good
Markland:			

of wildlife habitat and kinds of wildlife—Continued

Wildlife habitat elements—Continued			Kinds of wildlife		
Hardwood trees	Wetland plants	Shallow water areas	Openland	Woodland	Wetland
Good	Poor	Very poor	Good	Good	Very poor.
Good	Very poor	Very poor	Good	Good	Very poor.
Good	Very poor	Very poor	Fair	Good	Very poor.
Good	Poor	Very poor	Good	Good	Very poor.
Good	Very poor	Very poor	Good	Good	Very poor.
Good	Very poor	Very poor	Fair	Good	Very poor.
Good	Poor	Very poor	Good	Good	Very poor.
Good	Very poor	Very poor	Good	Good	Very poor.
Good	Very poor	Very poor	Fair	Good	Very poor.
Good	Very poor	Very poor	Fair	Good	Very poor.
Good	Poor	Very poor	Good	Good	Very poor.
Good	Very poor	Very poor	Good	Good	Very poor.
Good	Very poor	Very poor	Fair	Good	Very poor.
Good	Fair	Fair	Good	Good	Fair.
Good	Poor	Very poor	Good	Good	Very poor.
Good	Very poor	Very poor	Good	Good	Very poor.
Good	Very poor	Very poor	Fair	Good	Very poor.
Good	Poor	Very poor	Good	Good	Very poor.
Good	Very poor	Very poor	Good	Good	Very poor.
Poor	Good	Fair	Poor	Poor	Fair.
Good	Poor	Very poor	Good	Good	Very poor.
Good	Very poor	Very poor	Good	Good	Very poor.
Good	Very poor	Very poor	Fair	Good	Very poor.
Poor	Good	Good	Poor	Poor	Good.
Good	Very poor	Very poor	Good	Good	Very poor.
Good	Very poor	Very poor	Fair	Good	Very poor.
Good	Very poor	Very poor	Good	Good	Very poor.
Good	Poor	Very poor	Good	Good	Very poor.
Good	Very poor	Very poor	Fair	Good	Very poor.
Good	Poor	Very poor	Good	Good	Very poor.
Good	Very poor	Very poor	Good	Good	Very poor.
Good	Poor	Very poor	Good	Good	Very poor.
Good	Very poor	Very poor	Good	Good	Very poor.
Poor	Very poor	Very poor	Poor	Poor	Very poor.
Poor	Very poor	Very poor	Poor	Poor	Very poor.
Poor	Very poor	Very poor	Poor	Poor	Very poor.
Good	Poor	Very poor	Good	Good	Very poor.
Good	Very poor	Very poor	Good	Good	Very poor.
Good	Very poor	Very poor	Fair	Good	Very poor.
Good	Very poor	Very poor	Fair	Good	Very poor.

TABLE 3.—*Suitability of the soils for elements*

Soil series and map symbols	Wildlife habitat elements		
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants
Patton: Pa, Pb	Fair	Poor	Poor
Peoga: Pe	Poor	Fair	Fair
Philo: Pn	Fair	Good	Good
Ross: Rn	Good	Good	Good
Rossmoyne:			
RpA	Good	Good	Good
RpB, RpB2	Good	Good	Good
RsC3, RpC2	Fair	Good	Good
RpD2	Poor	Fair	Good
Russell: RuB	Good	Good	Good
Sardinia:			
SaA	Good	Good	Good
SaB	Good	Good	Good
SaC2	Fair	Good	Good
Shoals: Sh	Poor	Fair	Fair
Sleeth: SlA	Fair	Good	Good
Sloan: Sn	Poor	Poor	Poor
Stonelick: St	Fair	Good	Good
Thackery:			
ThA	Good	Good	Good
ThB	Good	Good	Good
Trappist:			
TrE	Poor	Fair	Good
TsB.			
Trappist part of TsB	Fair	Good	Good
Muse part of TsB	Good	Good	Good
TsC2	Fair	Good	Good
TsD2	Poor	Fair	Good
Tuscarawas:			
TuD	Poor	Fair	Good
TuF	Very poor	Fair	Good
Warsaw: WaA	Good	Good	Good
Wea: WeA, WeB	Good	Good	Good
Wellston:			
WlC	Fair	Good	Good
WlD	Poor	Fair	Good
Westland: Ws, Wt	Fair	Poor	Poor
Williamsburg:			
WvA, WvB	Good	Good	Good
WvC	Fair	Good	Good
Xenia: XeB	Good	Good	Good

of wildlife habitat and kinds of wildlife—Continued

Wildlife habitat elements—Continued			Kinds of wildlife		
Hardwood trees	Wetland plants	Shallow water areas	Openland	Woodland	Wetland
Poor	Good	Fair	Poor	Poor	Fair.
Fair	Good	Good	Fair	Fair	Good.
Good	Poor	Poor	Good	Good	Poor.
Good	Poor	Very poor	Good	Good	Very poor.
Good	Poor	Poor	Good	Good	Poor.
Good	Poor	Very poor	Good	Good	Very poor.
Good	Very poor	Very poor	Good	Good	Very poor.
Good	Very poor	Very poor	Fair	Good	Very poor.
Good	Poor	Very poor	Good	Good	Very poor.
Good	Poor	Poor	Good	Good	Poor.
Good	Poor	Very poor	Good	Good	Very poor.
Good	Very poor	Very poor	Good	Good	Very poor.
Good	Fair	Fair	Fair	Good	Fair.
Good	Fair	Very poor	Good	Good	Poor.
Poor	Good	Fair	Poor	Poor	Fair.
Good	Poor	Very poor	Good	Good	Very poor.
Good	Poor	Poor	Good	Good	Poor.
Good	Poor	Very poor	Good	Good	Very poor.
Good	Very poor	Very poor	Fair	Good	Very poor.
Good	Poor	Very poor	Good	Good	Very poor.
Good	Poor	Very poor	Good	Good	Very poor.
Good	Very poor	Very poor	Good	Good	Very poor.
Good	Very poor	Very poor	Fair	Good	Very poor.
Good	Very poor	Very poor	Fair	Good	Very poor.
Good	Poor	Very poor	Good	Good	Very poor.
Good	Poor	Very poor	Good	Good	Very poor.
Good	Very poor	Very poor	Good	Good	Very poor.
Good	Very poor	Very poor	Fair	Good	Very poor.
Poor	Good	Fair	Poor	Poor	Fair.
Good	Poor	Very poor	Good	Good	Very poor.
Good	Very poor	Very poor	Good	Good	Very poor.
Good	Poor	Very poor	Good	Good	Very poor.

Engineering Uses of the Soils[4]

This section is useful to those who need information about soils used as structural material or as foundation

Engineering soil classification systems

The two systems most commonly used in classifying samples of soils for engineering are the Unified system (*3*)

moisture is further increased, the material changes from plastic to liquid. The plastic limit is the moisture content at which the soil material passes from semisolid to plastic; and the liquid limit, from plastic to liquid. The plasticity

Corrosivity, as used in table 5, pertains to potential soil-induced chemical action that dissolves or weakens uncoated steel or concrete. Rate of corrosion of uncoated steel is related to soil properties such as drainage, texture, total acidity, and electrical conductivity of the soil

TABLE 4.—*Engineering*

[Tests performed by the Ohio Department of Highways in accordance with standard

Soil name and location	Parent material	Report No.	Depth	Moisture density data [1]	
				Maximum dry density	Optimum moisture
			Inches	*Lb per cu ft*	*Percent*
Atlas silt loam:					
In a cultivated field 5 miles west of Hillsboro, ¼ mile south of U.S. Highway 50, ⅛ mile east of Kessler Road, and 125 feet north of stream; in Union Township (Modal).	Glacial till (Illinoian age).	14077	0–7	110	17
		14078	12–30	102	20
		14079	67–90	119	13
Avonburg silt loam:					
In a cultivated field 1⅛ miles west-northwest of Mowrystown on State Route 321, 1⅛ miles north of the intersection of Stringtown and Marconette Roads, 50 yards east-northeast of Stringtown Road; in White Oak Township (Modal).	Loess capped glacial till (Illinoian age).	14084	0–9	107	18
		14085	31–39	100	21
		14086	39–55	102	20
		14087	99–124	119	13
Boston silt loam:					
In a cultivated field 2¼ miles east of Hillsboro on U.S. Highway 50, ⅝ mile south-southeast on Haggerty Road, 300 yards west of Haggerty Road, and 45 yards south of woods; in Liberty Township (Modal).	Loess capped glacial till (Illinoian age) over limestone residuum.	60452	12–18	107	18
		60453	23–32	112	16
		60454	32–53	83	31
Cincinnati silt loam:					
1¼ miles south-southwest of Hillsboro, 0.7 mile south of Griffith	Loess capped glacial till	61002	16–28	110	17

test data

procedures of the American Association of State Highway and Transportation Officials (*2*)]

Mechanical analysis [2]			Classification	
[redacted]				

TABLE 4.—*Engineering*

Soil name and location	Parent material	Report No.	Depth	Moisture density data [1]	
				Maximum dry density	Optimum moisture
			Inches	*Lb per cu ft*	*Percent*
Negley loam:					
In a cultivated field 2 miles south of Hillsboro, 225 feet west of State Route 247, ¼ mile south of Rocky Fork Creek; in Lib-	Glacial outwash (Illinoian age)	61097	24–42	112	16
		61098	126–156	130	10

test data—Continued

Mechanical analysis [2]						Liquid limit	Plasticity index	Classification	
Percentage passing sieve—					Percentage smaller than 0.005 mm			AASHTO [3]	Unified [4]
3-inch	No. 4 (4.7 mm)	No. 10 (2.0 mm)	No. 40 (0.42 mm)	No. 200 (0.074 mm)					
						Pct			
100	83	77	59	45	28	37	12	A-6(3)	SC
100	86	77	25	8	0	NP	NP	A-1-b	SM-SC
100	100	99	96	94	45	40	16	A-6(10)	CL-ML
100	99	95	90	87	44	39	16	A-6(10)	CL
100	99	94	92	90	74	57	22	A-7-5(16)	MH
100	94	75	75	74	51	59	27	A-7-6(18)	CH-MH
100	99	78	76	53	34	34	12	A-6(4)	CL-ML
100	100	100	96	89	34	30	8	A-4(8)	CL-ML
100	99	96	94	84	45	34	12	A-6(9)	CL-ML
100	99	97	94	71	43	29	11	A-6(8)	CL
100	97	86	79	64	36	32	13	A-6(7)	CL
100	100	97	94	81	41	29	11	A-6(16)	CL
100	98	95	90	72	35	24	5	A-4(7)	CL-ML
100	100	100	100	91	43	34	13	A-6(9)	CL
100	100	100	99	86	41	33	12	A-6(9)	CL
100	65	62	49	38	21	35	14	A-6(2)	GC
100	98	96	94	87	39	37	13	A-6(9)	CL-ML
100	95	87	68	35	20	NP	NP	A-2-4	SM
100	94	89	83	60	32	30	13	A-6(6)	CL

and the material coarser than 2 millimeters in diameter is excluded from calculations of grain-size fractions. The mechanical analyses used in this table are not suitable for naming textural classes for soil.

[3] Based on AASHTO Designation M 145-49 (*2*).

[4] Based on Classification of Soils for Engineering Purposes, ASTM method D 2487-66T (*3*).

[5] NP means nonplastic.

TABLE 5.—*Estimated soil*

[An asterisk in the first column indicates that at least one mapping unit in this series is made up of two or more kinds of soil. The soils in of this table. Absence of data indicates that the soil properties are too variable to be estimated or

Soil series and map symbols	Depth to—		Depth from surface	Dominant USDA texture	Classification		Coarse fraction larger than 3 inches
	Seasonal high water table	Bedrock			Unified	AASHTO	
	Feet	*Feet*	*In*				*Percent*
Algiers: Ag	[2] ½–1½	>5	0–22	Silt loam	ML, CL–ML	A–4	
			22–44	Silt loam, loam	CL	A–6, A–7	
			44–60	Gravelly loam	CL, SC	A–6	
Atlas: AtB, AtB2, AtC2, AtC3	½–1½	>5	0–7	Silt loam	ML, CL	A–4	
			7–24	Clay loam	CL	A–6, A–7	
			24–51	Silty clay	CH, CL	A–7	
			51–77	Clay loam	CL	A–6, A–4	
Avonburg: AvA, AvB, AxA	½–1½	>5	0–15	Silt loam	ML, CL	A–4, A–6	
Urban land part of AxA is too variable to be estimated.			15–31	Silt loam, silty clay loam.	CL	A–6	
			31–39	Silty clay loam (fragipan).	CL	A–6, A–7	
			39–99	Clay loam, silty clay loam.	CL	A–6, A–7	
Beasley: BeC2, BeD2	1½–3	2½–5	0–5	Silt loam	ML, CL–ML	A–4	
			5–31	Silty clay loam, clay.	CH	A–7	
			31–38	Silty clay	CH	A–7	0–5
			38	Shale.			
*Berks: BgF, BgG, BhD, BhF, BhG— For Muskingum parts, see Musk-	>3	1½–3	0–6	Channery silt loam.	ML, GM	A–4	0–20

properties significant in engineering

such mapping units may have different properties, and for this reason it is necessary to refer to other series as indicated in the first column that no estimate was made. The symbol > means more than; the symbol < means less than]

Percentage passing sieve—				Permeability	Available water capacity	Reaction [1]	Shrink-swell potential	Corrosivity	
No. 4 (4.7 mm)	No. 10 (2.0 mm)	No. 40 (0.42 mm)	No. 200 (0.074 mm)					Uncoated steel	Concrete
				In per hr	*In per in of soil*	*pH*			
100	90–100	80–95	70–85	0. 6–2. 0	0. 17–0. 22	6. 1–7. 3	Low	High	Low.
100	90–100	80–95	70–80	0. 6–2. 0	0. 16–0. 20	6. 1–7. 8	Low	High	Low.
85–100	50–85	45–80	40–75	0. 6–2. 0	0. 13–0. 17	6. 6–7. 8	Low	High	Low.
100	90–100	85–100	80–95	0. 6–2. 0	0. 16–0. 19	5. 1–6. 5	Low	High	High.
100	90–100	85–100	80–95	0. 2–0. 6	0. 11–0. 15	4. 5–6. 0	Moderate	High	High.
100	90–100	90–100	85–95	<0. 06	0. 08–0. 12	4. 5–6. 5	High	High	High.
90–100	80–100	70–90	60–80	0. 06–0. 2	0. 08–0. 12	5. 1–7. 8	Moderate	High	Moderate.
100	100	90–100	70–90	0. 6–2. 0	0. 16–0. 19	4. 5–6. 5	Low	High	High.
100	100	90–100	75–90	0. 2–0. 6	0. 12–0. 16	4. 0–5. 5	Low	High	High.
100	90–100	85–100	80–95	<0. 06	0. 07–0. 11	4. 0–5. 5	Moderate	High	High.
90–100	80–100	75–100	70–90	0. 06–0. 2	0. 07–0. 11	4. 5–7. 3	Moderate	High	Moderate.
100	90–100	80–95	70–90	0. 6–2. 0	0. 16–0. 20	4. 5–6. 0	Moderate	Moderate	Moderate.
100	90–100	85–95	75–95	0. 06–0. 6	0. 11–0. 17	4. 5–6. 0	High	High	Moderate.
90–100	85–95	75–90	60–80	0. 06–0. 6	0. 10–0. 14	6. 6–8. 4	High	High	Low.
60–90	50–80	45–70	40–60	0. 6–2. 0	0. 13–0. 17	5. 1–6. 0	Low	Low	Moderate.
55–80	50–70	35–60	30–50	0. 6–2. 0	0. 09–0. 13	4. 5–6. 0	Low	Low	High.
40–70	30–50	20–40	15–35	2. 0–6. 0	0. 07–0. 10	4. 5–5. 0	Low	Low	High.
100	95–100	85–95	75–90	0. 6–2. 0	0. 16–0. 20	5. 1–6. 0	Low	High	Moderate.

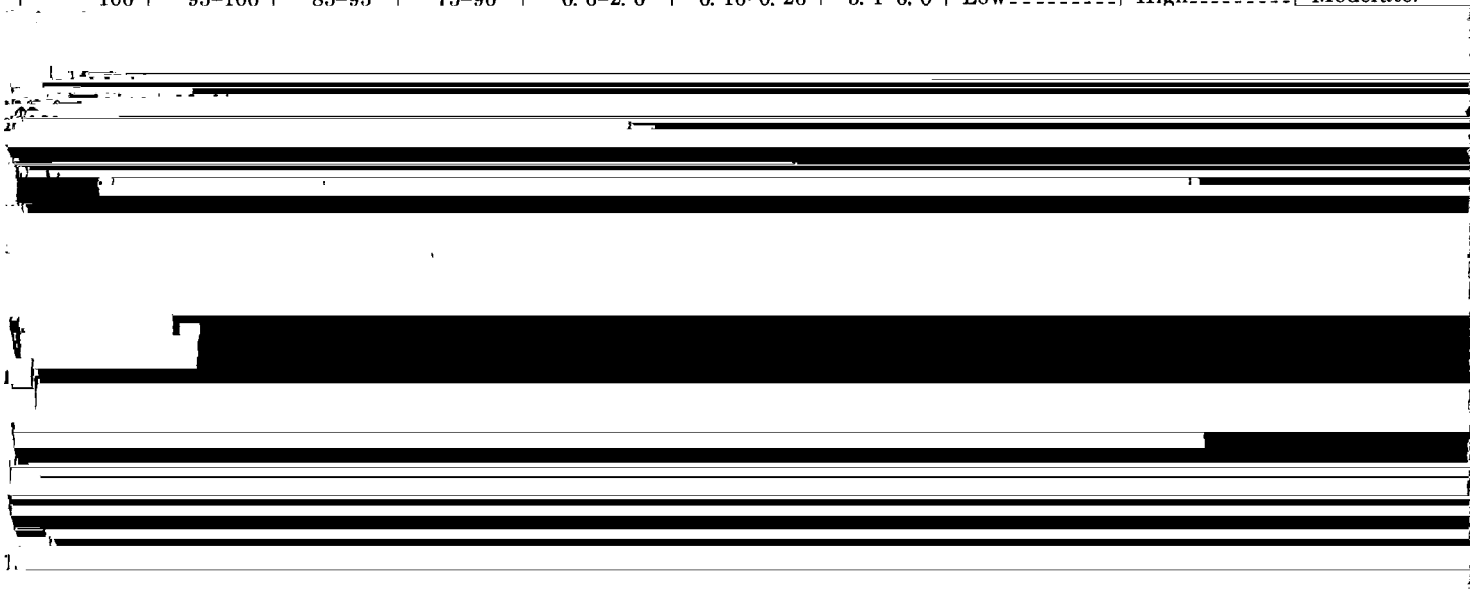


TABLE 5.—*Estimated soil*

Soil series and map symbols	Depth to—		Depth from surface	Dominant USDA texture	Classification		Coarse fraction larger than 3 inches
	Seasonal high water table	Bedrock			Unified	AASHTO	
	Feet	*Feet*	*In*				*Percent*
Cana: CaB, CaC2, CaD2, CaF	1½–3	2½–5	0–13	Silt loam	ML, CL–ML	A–4	
			13–36	Silty clay loam, clay loam.	CL	A–6, A–7	
			36–55	Clay, silty clay.	CH	A–7	0–5
			55	Shale bedrock.			
Casco: CcD3, CcF2	>3	>5	0–6	Gravelly loam	ML	A–4	
			6–20	Gravelly clay loam.	CL, SC	A–6	
			20–60	Stratified sand and gravel, gravelly sandy loam.	SM, GM, SW, GW	A–1	0–10
*Celina: CeB, CfB, CgA, CgB Urban land part of CfB is too variable to be estimated. For Xenia parts of CgA and CgB, see Xenia series.	1–3	>5	0–7	Silt loam	ML, CL–ML	A–4	
			7–39	Silty clay loam, clay, silty clay, clay loam.	CL	A–6, A–7	
			39–60	Loam	CL, CL–ML	A–4, A–6	0–5
Cincinnati: ChB, ChC2, ChD2	>3	>5	0–16	Silt loam	ML, CL	A–4	
			16–35	Silty clay loam, loam.	CL	A–6	
			35–52	Clay loam (fragipan).	CL	A–6	
			52–115	Clay loam, loam.	CL, ML	A–6, A–4, A–7	
Clermont: Cm	½–1	>5	0–13	Silt loam	ML, CL	A–4, A–6	
			13–43	Silty clay loam.	CL	A–6	
			43–100	Clay, silty clay, clay loam.	CL	A–7, A–6	
*Colyer: CoD2, CoF, CoG For Trappist parts, see Trappist series.	>3	1–1½	0–5	Silt loam	ML, CL–ML	A–4, A–6	
			5–19	Shaly silty clay loam.	CL, GC	A–6, A–4, A–2, A–1	0–10
			19	Shale bedrock.			
*Crosby: CrA, CsA, CsB, CuA For Fincastle parts of CsA and CsB, see Fincastle series. Urban land part of CuA is too variable to be estimated.	½–1½	>5	0–9	Silt loam	ML, CL–ML	A–4	
			9–31	Silty clay loam, clay, clay loam.	CL	A–6, A–7	
			31–60	Loam	CL, CL–ML	A–4, A–6	0–5
Dana: DaA, DaB	2–3	>5	0–14	Silt loam	ML, CL–LM	A–4	
			14–48	Silty clay loam, clay loam, silt loam.	CL	A–6, A–7	
			48–60	Loam	ML, CL	A–4, A–6	0–5
Dubois: DuA, DuB	½–1	>5	0–15	Silt loam	ML, CL–ML	A–4	
			15–31	Silty clay loam.	CL	A–6, A–7	
			31–59	Silty clay loam, clay loam (fragipan).	CL	A–6	
			59–131	Clay loam	CL, ML	A–6, A–4	

See footnotes at end of table.

properties significant in engineering—Continued

Percentage passing sieve—				Permeability	Available water capacity	Reaction [1]	Shrink-swell potential	Corrosivity	
No. 4 (4.7 mm)	No. 10 (2.0 mm)	No. 40 (0.42 mm)	No. 200 (0.074 mm)					Uncoated steel	Concrete
				In per hr	*In per in of soil*	*pH*			
100	90–100	80–100	70–95	0. 6–2. 0	0. 15–0. 19	5. 6–7. 3	Low	Moderate	Moderate.
95–100	90–100	80–95	70–90	0. 2–0. 6	0. 13–0. 17	4. 5–6. 0	Moderate	High	High.
95–100	70–100	65–95	60–90	0. 06–0. 2	0. 08–0. 12	4. 0–5. 5	Moderate	High	High.
90–100	80–95	65–80	50–70	0. 6–6. 0	0. 14–0. 18	6. 5–7. 3	Low	Low	Low.
70–90	60–75	50–65	40–60	0. 6–6. 0	0. 12–0. 16	6. 1–7. 3	Low	Low	Low.
50–80	40–60	20–35	4–15	>6. 0	0. 03–0. 06	7. 4–7. 8	Low	Low	Low.
100	90–100	80–100	70–95	0. 6–2. 0	0. 17–0. 20	5. 6–7. 3	Low	Moderate	Moderate.
100	90–100	75–95	65–90	0. 2–0. 6	0. 12–0. 16	4. 5–7. 8	Moderate	High	Moderate.
85–100	75–95	60–85	50–75	0. 2–0. 6	0. 06–0. 10	7. 4–7. 8	Low	Moderate	Low.
100	100	90–100	80–95	0. 6–2. 0	0. 16–0. 20	5. 1–6. 5	Low	Low	Moderate.
100	95–100	90–100	70–95	0. 6–2. 0	0. 13–0. 17	4. 5–5. 5	Low	Moderate	High.
95–100	85–100	75–95	65–80	0. 2–0. 6	0. 06–0. 10	4. 5–5. 5	Low	Moderate	High.
90–100	80–100	75–95	55–80	0. 2–2. 0	0. 06–0. 10	5. 1–7. 8	Low	Moderate	Moderate to low.
95–100	85–100	80–95	75–90	0. 2–0. 6	0. 16–0. 17	5. 1–6. 5	Low	High	Moderate.
95–100	95–100	90–100	85–95	0. 06–0. 2	0. 13–0. 17	4. 5–5. 5	Moderate	High	High.
95–100	85–100	75–95	65–80	<0. 06	0. 10–0. 15	4. 5–7. 3	Low	High	Moderate to low.
80–100	75–90	65–90	60–85	0. 6–2. 0	0. 15–0. 18	4. 0–5. 5	Low	Low	High.
70–95	20–85	15–75	12–65	0. 2–0. 6	0. 08–0. 13	4. 0–5. 5	Moderate	Moderate	High.
100	90–100	80–95	70–90	0. 6–2. 0	0. 17–0. 20	5. 6–7. 3	Low	High	Moderate.
95–100	75–95	70–95	65–90	0. 06–0. 2	0. 12–0. 16	5. 6–7. 8	Moderate	High	Moderate.
90–100	70–90	60–80	50–70	0. 2–0. 6	0. 12–0. 16	7. 4–7. 8	Low	High	Low.
100	95–100	85–95	75–95	0. 6–2. 0	0. 18–0. 22	5. 6–6. 5	Low	Low	Moderate.
95–100	85–100	80–95	70–90	0. 6–2. 0	0. 16–0. 19	5. 1–7. 3	Moderate	Moderate	Moderate.
90–100	80–95	70–90	60–80	0. 6–2. 0	0. 15–0. 18	5. 6–7. 8	Low	Low	Moderate.
100	90–100	80–95	70–90	0. 6–2. 0	0. 17–0. 21	5. 6–6. 5	Low	High	Moderate.
100	95–100	80–100	75–95	0. 2–0. 6	0. 13–0. 17	4. 5–6. 0	Moderate	High	High.
100	90–100	80–95	70–90	<0. 06	0. 06–0. 10	4. 5–6. 0	Low	High	High.
80–100	75–100	70–95	60–80	0. 06–0. 6	0. 06–0. 10	6. 6–8. 4	Low	High	Low.

TABLE 5.—*Estimated soil*

Soil series and map symbols	Depth to—		Depth from surface	Dominant USDA texture	Classification		Coarse fraction larger than 3 inches
	Seasonal high water table	Bedrock			Unified	AASHTO	
	Feet	*Feet*	*In*				*Percent*
Edenton: EbC2, EbD2, EbF2	>3	2–3½	0–4	Silt loam	ML, CL	A–4, A–6	

properties significant in engineering—Continued

Percentage passing sieve—				Permeability	Available water capacity	Reaction [1]	Shrink-swell potential	Corrosivity	
No. 4 (4.7 mm)	No. 10 (2.0 mm)	No. 40 (0.42 mm)	No. 200 (0.074 mm)					Uncoated steel	Concrete
				In per hr	*In per in of soil*	*pH*			
95–100	90–100	75–95	60–90	0. 6–2. 0	0. 16–0. 19	5. 6–7. 3	Low	Moderate	Moderate.
95–100	80–95	70–95	60–90	0. 2–0. 6	0. 13–0. 17	5. 1–7. 3	Moderate	High	Moderate.
90–100	70–95	65–85	60–80	0. 2–0. 6	0. 10–0. 13	6. 6–7. 8	Moderate	High	Low.
100	95–100	90–100	70–90	0. 6–2. 0	0. 18–0. 22	6. 1–6. 5	Low	Moderate	Low.
100	95–100	85–100	70–90	0. 6–2. 0	0. 16–0. 20	6. 1–8. 4	Low	Moderate	Low.
95–100	90–100	65–80	30–75	0. 6–6. 0	0. 13–0. 17	7. 4–8. 4	Low	Moderate	Low.
100	100	90–100	75–95	0. 6–2. 0	0. 17–0. 21	5. 1–6. 5	Low	High	Low.
100	100	95–100	80–95	0. 2–0. 6	0. 14–0. 18	5. 1–5. 5	Moderate	High	Moderate.
90–100	75–100	70–90	60–80	0. 2–0. 6	0. 13–0. 17	6. 1–7. 8	Moderate	High	Low.
100	100	95–100	80–95	0. 6–2. 0	0. 17–0. 21	6. 6–7. 3	Low	High	Low.
95–100	95–100	90–100	80–95	0. 2–0. 6	0. 15–0. 18	5. 1–6. 5	Moderate	High	Moderate.
90–100	80–100	70–90	55–85	0. 6–2. 0	0. 14–0. 17	6. 1–7. 3	Moderate	High	Low.
65–90	55–75	50–70	40–55	0. 6–6. 0	0. 10–0. 15	6. 6–7. 8	Low	High	Low.
90–100	80–100	75–95	70–85	0. 6–2. 0	0. 12–0. 19	5. 6–6. 5	Low	Low	Moderate.
80–100	60–95	55–80	50–70	0. 6–2. 0	0. 06–0. 14	5. 1–7. 3	Low	Moderate	Moderate.
40–75	30–50	15–45	3–35	>6. 0	0. 02–0. 08	7. 4–7. 8	Low	Low	Low.
80–100	70–95	65–90	60–85	0. 2–0. 6	0. 15–0. 18	6. 6–7. 5	Moderate	Moderate	Low.
75–95	65–90	60–85	55–80	0. 2–0. 6	0. 10–0. 16	6. 6–7. 8	Moderate	High	Low.
100	95–100	85–95	70–90	0. 6–2. 0	0. 17–0. 22	6. 6–7. 5	Low	Low	Low.
95–100	90–100	80–95	70–90	0. 6–2. 0	0. 16–0. 20	6. 1–8. 4	Low	Low	Low.
90–100	85–100	65–85	35–75	0. 6–6. 0	0. 10–0. 14	6. 6–8. 4	Low	Low	Low.
100	100	90–100	75–95	0. 6–2. 0	0. 16–0. 19	5. 6–7. 3	Low	Low	Moderate.
95–100	90–100	80–95	70–95	0. 6–2. 0	0. 14–0. 17	4. 5–6. 5	Moderate	Moderate	Moderate.
90–100	85–100	80–95	70–90	0. 6–2. 0	0. 10–0. 14	5. 1–7. 8	Moderate	High	Moderate.
95–100	90–100	80–95	70–90	0. 6–2. 0	0. 16–0. 19	5. 1–6. 0	Low	Moderate	Moderate.
90–100	85–100	75–95	65–90	0. 06–0. 6	0. 10–0. 15	5. 1–8. 4	Moderate	High	Moderate to low.

TABLE 5.—*Estimsted soil*

Soil series and map symbols	Depth to—		Depth from surface	Dominant USDA texture	Classification		Coarse fraction larger than 3 inches
	Seasonal high water table	Bedrock			Unified	AASHTO	
	Feet	*Feet*	*In*				*Percent*
Haubstadt: HbA, HbB, HbC2, HbC3, HbD2, HbD3, HcB, HcC. Urban land parts of HcB and HcC are too variable to be estimated.	1–3	>5	0–18	Silt loam, loam	ML, CL	A–4	
			18–53	Loam (fragipan).	CL	A–6	
			53–110	Clay loam, gravelly clay loam.	CL	A–6	
*Hennepin: HeF2, HeG2, HfE3. For Miamian parts, see Miamian series.	>3	>5	0–7	Silt loam	ML, CL	A–4, A–6	
			7–11	Clay loam	CL	A–6	
			11–60	Gravelly clay loam, gravelly loam.	CL, ML	A–6, A–4	0–5
Hickory: HkC2, HkD2, HkE2, HkF2, HyC3, HyD3, HyE3.	>3	>5	0–6	Silt loam	ML, CL–ML	A–4	
			6–36	Silty clay loam, clay loam.	CL	A–6, A–7	
			36–60	Clay loam	CL	A–6	0–5
Jessup: JeD	>3	4–10	0–10	Silt loam	ML, CL–ML	A–4	
			10–17	Silty clay loam.	CL	A–6	
			17–38	Silty clay loam, clay.	CH, CL	A–7	
			38–60	Silty clay	CH	A–7	
Johnsburg: JoC	1–3	4–6	0–8	Silt loam	ML, CL–ML	A–4	
			8–28	Silt loam, silty clay loam.	CL, ML	A–6, A–4, A–7	
			28–45	Silty clay loam (fragipan).	CL	A–6, A–7	
			45–60	Clay loam	CL	A–6	0–10
			60	Sandstone bedrock.			
Kendallville: KeB, KeC2, KeD2, KfD3.	>3	>5	0–6	Silt loam, clay loam.	ML, CL	A–4, A–6	
			6–38	Clay loam, gravelly sandy clay loam.	CL, SC	A–6	0–5
			38–60	Clay loam, loam.	ML, CL	A–4, A–6	0–5
Lawshe: LhB, LhC2, LhD2, LID3	>1½	2½–5	0–10	Silty clay loam, silty clay.	CL, MH, CH	A–6, A–7	
			10–44	Silty clay	CH	A–7	0–5
			44	Shale bedrock.			
*Loudon: LoB, LoB2, LoC2, LoD2, LpE2. For Edenton part of LpE2, see Edenton series.	1–3	4–10	0–12	Silt loam	ML, CL–ML	A–4	
			12–26	Silty clay loam.	CL	A–6, A–7	
			26–70	Silty clay, silty clay loam.	CH, CL	A–7	
			70	Soft weathered shale bedrock.			
Markland: MdB, MdC2, MdD2	1–3	>5	0–6	Silt loam	ML, CL–ML	A–4	
			6–61	Silty clay loam, silty loam.	CH, CL	A–7, A–6	

See footnotes at end of table.

properties significant in engineering—Continued

Percentage passing sieve—				Permeability	Available water capacity	Reaction [1]	Shrink-swell potential	Corrosivity	
No. 4 (4.7 mm)	No. 10 (2.0 mm)	No. 40 (0.42 mm)	No. 200 (0.074 mm)					Uncoated steel	Concrete
				In per hr	*In per in of soil*	*pH*			
95–100	75–100	70–95	50–85	0. 6–2. 0	0. 17–0. 20	4. 5–6. 5	Low	Moderate	Moderate.
90–100	85–100	80–95	65–80	0. 06–0. 2	0. 10–0. 14	4. 5–6. 0	Moderate	Moderate	High.
80–100	60–90	60–85	55–75	0. 6–2. 0	0. 10–0. 14	4. 5–7. 3	Low	High	High.
95–100	90–100	85–100	70–95	0. 6–2. 0	0. 17–0. 19	6. 1–7. 5	Low	Low	Low.
90–100	80–100	75–90	65–85	0. 6–2. 0	0. 14–0. 17	6. 1–8. 4	Low	Moderate	Low.
80–100	65–90	60–85	55–75	0. 6–2. 0	0. 10–0. 13	7. 4–8. 4	Low	Moderate	Low.
100	95–100	85–100	70–90	0. 6–2. 0	0. 17–0. 19	6. 1–7. 5	Low	Moderate	Low.
95–100	90–100	80–95	65–90	0. 6–2. 0	0. 14–0. 17	4. 5–7. 8	Moderate	High	Moderate.
90–100	85–100	75–90	65–85	0. 6–2. 0	0. 13–0. 15	7. 4–7. 8	Low	High	Low.
100	100	80–100	75–95	0. 6–2. 0	0. 17–0. 19	5. 6–6. 5	Low	Low	Moderate.
100	95–100	85–95	75–90	0. 6–2. 0	0. 14–0. 17	4. 5–6. 0	Low	Moderate	Moderate.
90–100	80–100	75–95	70–90	0. 2–0. 6	0. 13–0. 15	4. 5–6. 0	Moderate	High	Moderate.
90–100	75–95	70–90	65–80	0. 06–0. 2	0. 10–0. 13	6. 6–7. 8	Moderate	High	Low.
100	100	85–100	75–95	0. 6–2. 0	0. 17–0. 20	5. 1–6. 5	Low	High	Moderate.
100	95–100	85–95	75–95	0. 2–0. 6	0. 14–0. 17	4. 5–6. 0	Moderate	High	High.
95–100	90–100	80–95	70–90	<0. 06	0. 06–0. 10	4. 0–5. 0	Low	High	High.
90–100	80–100	75–90	65–85	0. 2–0. 6	0. 06–0. 10	4. 0–5. 0	Low	High	High.
95–100	85–100	80–95	70–90	0. 6–2. 0	0. 17–0. 20	5. 6–6. 5	Low	Low	Moderate.
80–100	65–90	50–80	40–70	0. 2–0. 6	0. 12–0. 16	5. 1–7. 8	Moderate	Moderate	Moderate.
80–100	65–85	60–80	55–75	0. 2–2. 0	0. 12–0. 16	7. 4–7. 8	Low	Moderate	Low.
100	95–100	90–100	80–95	0. 2–0. 6	0. 14–0. 17	6. 6–7. 5	Moderate	High	Low.
95–100	90–100	85–95	80–90	<0. 06	0. 12–0. 15	6. 6–8. 4	High	High	Low.
100	95–100	85–100	80–95	0. 6–2. 0	0. 16–0. 19	5. 1–6. 5	Low	Low	Moderate.
95–100	90–100	85–95	75–95	0. 2–0. 6	0. 13–0. 17	4. 5–6. 5	Moderate	Moderate	Moderate.
95–100	80–100	80–100	75–100	0. 06–0. 2	0. 10–0. 14	5. 1–8. 4	Moderate	High	Moderate to low.
100	95–100	85–100	75–95	0. 6–2. 0	0. 15–0. 19	5. 6–6. 5	Low	Moderate	Moderate.
100	90–100	85–100	80–95	0. 06–0. 2	0. 10–0. 15	5. 1–7. 8	Moderate	High	Moderate to low.

TABLE 5.—*Estimated soil*

Soil series and map symbols	Depth to—		Depth from surface	Dominant USDA texture	Classification		Coarse fraction larger than 3 inches
	Seasonal high water table	Bedrock			Unified	AASHTO	
	Feet	*Feet*	*In*				*Percent*
McGary: MgB	½–1½	>5	0–8	Silt loam	ML, CL	A–6, A–4	
			8–40	Silty clay loam, silty clay.	CH, CL	A–6, A–7	
			40–60	Silty clay, clay.	CH	A–7	
*Miamian: MlB, MlB2, MlC2, MlD2, MlE, MmC3, MrB, MrB2, MrC2, MsB. For Russell parts of MrB, MrB2, and MrC2, see Russell series. Urban land part of MsB is too variable to be estimated.	>3	>5	0–7	Silt loam, clay loam.	ML, CL	A–4, A–6	
			7–30	Clay, clay loam, silty clay loam.	CH, CL	A–7, A–6	
			30–60	Clay loam, loam.	CL	A–6, A–7	0–5
Millsdale: Mt	0–1	2½–3½	0–13	Silty clay loam.	CL, CL–ML	A–6	
			13–32	Silty clay, clay, silty clay loam.	CH, CL	A–7	0–5
			32	Limestone bedrock.			
Milton: MuB, MuB2, MuC2, MuD2, MwC3.	>3	1½–3½	0–12	Silt loam, clay loam.	ML, CL	A–4, A–6	
			12–21	Silty clay loam, clay loam.	CL	A–6, A–7	
			21–33	Clay	CH	A–7	0–10
			33	Limestone bedrock.			
Montgomery: My	0–1	>5	0–16	Silty clay loam	CL, CL–ML	A–6	
			16–60	Silty clay, clay, silty clay loam.	CH, CL	A–7	
Muse	>3	3–6½	0–12	Silt loam	ML, CL–ML	A–4	0–5
Mapped only in complexes with Trappist soils.			12–37	Silty clay, silty clay loam.	CH, CL	A–7, A–6	0–10
			37–52	Shaly silty clay loam.	CL, CH	A–7, A–6	5–25
			52	Black fissile shale bedrock.			
Muskingum	>3	1½–3½	0–6	Channery silt loam.	ML	A–4	5–15
Mapped only in complexes with Berks soils and with Berks and Neotoma soils.			6–25	Channery silt loam, channery loam.	ML, GM	A–4	10–30
			25	Sandstone bedrock.			
*Negley: NdC, NdD, NdE, NdF, NeB, NfC3, NfD3, NgF. For Fox part of NgF, see Fox series.	>3	>5	0–14	Loam, silt loam, clay loam.	ML, CL	A–4, A–6	
			14–33	Loam, gravelly clay loam.	ML, CL, SM, SC	A–4, A–2, A–6	
			33–126	Gravelly sandy clay loam, sandy clay.	GM, SM, SC	A–2, A–4, A–7	0–5
			126–156	Sand and gravel.	GM, GW, SM, SP, SC	A–1, A–2	0–5

See footnotes at end of table.

properties significant in engineering—Continued

Percentage passing sieve—				Permeability	Available water capacity	Reaction [1]	Shrink-swell potential	Corrosivity	
No. 4 (4.7 mm)	No. 10 (2.0 mm)	No. 40 (0.42 mm)	No. 200 (0.074 mm)					Uncoated steel	Concrete
				In per hr	*In per in of soil*	*pH*			
100	100	95–100	75–95	0. 6–2. 0	0. 16–0. 19	6. 6–7. 3	Low	High	Low.
100	100	95–100	90–95	0. 06–0. 2	0. 12–0. 16	5. 6–7. 8	Moderate	High	Moderate.
100	95–100	90–100	80–90	<0. 06	0. 10–0. 14	7. 4–7. 8	Moderate	High	Low.
90–100	90–100	85–100	70–90	0. 6–2. 0	0. 16–0. 19	5. 6–7. 3	Low	Moderate	Moderate.
90–100	90–100	80–95	70–90	0. 2–0. 6	0. 11–0. 15	5. 1–7. 3	Moderate	High	Moderate.
90–100	85–100	70–90	60–80	0. 2–0. 6	0. 12–0. 16	6. 6–7. 8	Low	Moderate	Low.
95–100	90–100	85–100	80–95	0. 6–2. 0	0. 18–0. 23	6. 1–7. 3	Moderate	High	Low.
90–100	80–100	80–95	70–95	0. 2–0. 6	0. 11–0. 17	6. 1–8. 4	High	High	Low.
95–100	90–100	85–100	70–95	0. 6–2. 0	0. 17–0. 20	5. 6–7. 3	Low	Low	Moderate.

Table 5.—Estimated soil properties

Soil series and map symbols	Depth to—		Depth from surface	Dominant USDA texture	Classification		Coarse fraction larger than 3 inches
	Seasonal high water table	Bedrock			Unified	AASHTO	
	Feet	*Feet*	*In*				*Percent*
Neotoma	>3	3–5	0–13	Channery silt loam.	ML, GM	A–4	5–25
Mapped only in complexes with Berks and Muskingum soils.			13–32	Channery silt loam.	ML, GM	A–4	15–35
			32–60	Very channery loam.	GM, ML	A–2, A–4	30–70
			60	Sandstone bedrock.			
Nicholson: NnB, NnB2, NnC2	1–3	3½–7½	0–8	Silt loam	ML	A–4	
			8–24	Silt loam	ML, CL	A–4, A–6	
			24–42	Silt loam, silty clay loam (fragipan).	CL	A–6	
			42–74	Clay, silty clay.	CH, MH	A–7	
			74	Limestone bedrock.			
Ockley: OcA, OcB, OcC2, OdB	>3	>5	0–9	Silt loam	ML	A–4	
Urban land part of OdB is too variable to be estimated.			9–21	Silty clay loam.	CL, CL–ML	A–6, A–7	
			21–58	Loam, gravelly loam, silty clay loam.	CL, ML	A–6, A–4	
			58–70	Gravelly sandy loam.	SM, GM	A–1, A–2	0–10
Opequon: OpD2, OpE2, OsF2, OsG, OtD3.	>3	1–1½	0–5	Silt loam	ML, CL	A–4, A–6	0–25
			5–19	Clay, silty clay loam.	CH, CL, MH	A–7	5–35
			19	Limestone bedrock.			
Otwell: OwB, OwC2, OwD2, OwE2, OwF.	>3	>5	0–14	Silt loam	ML	A–4	
			14–32	Silt loam, silty clay loam.	CL, ML	A–4, A–6	
			32–55	Silty clay loam, loam (fragipan).	CL, ML	A–6, A–4	
			55–110	Sandy clay loam.	SC, CL	A–6	0–5
Patton: Pa, Pb	0–1	>5	0–16	Silt loam, silty clay loam.	ML, CL	A–4, A–6	
			16–55	Silty clay loam	CL	A–6, A–7	
			55–105	Clay loam	CL	A–6, A–7	

significant in engineering—Continued

Percentage passing sieve—				Permeability	Available water capacity	Reaction [1]	Shrink-swell potential	Corrosivity	
No. 4 (4.7 mm)	No. 10 (2.0 mm)	No. 40 (0.42 mm)	No. 200 (0.074 mm)					Uncoated steel	Concrete
				In per hr	*In per in of soil*	*pH*			
65–85	60–80	50–70	45–65	0. 6–6. 0	0. 14–0. 20	5. 1–6. 5	Low	Low	Moderate.
55–80	50–75	45–70	40–60	0. 6–6. 0	0. 10–0. 16	5. 1–6. 5	Low	Low	Moderate.
40–65	35–60	30–50	25–45	2. 0–6. 0	0. 06–0. 10	4. 5–6. 5	Low	Low	High.
100	100	90–100	70–90	0. 6–2. 0	0. 16–0. 20	4. 5–6. 0	Low	Moderate	High.
100	95–100	90–100	70–95	0. 6–2. 0	0. 14–0. 18	4. 5–6. 0	Low	Moderate	High.
95–100	95–100	85–100	70–95	0. 06–0. 2	0. 08–0. 12	4. 5–6. 5	Low	High	High.
95–100	90–100	80–100	75–95	0. 06–0. 2	0. 06–0. 12	5. 6–7. 8	Moderate	High	Moderate to low.
100	100	80–100	70–90	0. 6–2. 0	0. 16–0. 20	4. 5–6. 0	Low	Low	High.
95–100	95–100	85–100	75–95	0. 6–2. 0	0. 13–0. 17	4. 5–6. 0	Moderate	Moderate	High.

TABLE 5.—*Estimated soil*

Soil series and map symbols	Depth to—		Depth from surface	Dominant USDA texture	Classification		Coarse fraction larger than 3 inches
	Seasonal high water table	Bedrock			Unified	AASHTO	
	Feet	*Feet*	*In*				*Percent*
Ross: Rn	[2] >3	>5	0–24	Silt loam	ML, CL–ML	A–4	
			24–55	Loam, silt loam	ML, CL–ML	A–4, A–6	
			55–81	Stratified sand and gravel.	SM, GM	A–2, A–1, A–4	0–5
Rossmoyne: RpA, RpB, RpB2, RpC2, RpD2, RsC3, RtB. Urban land part of RtB is too variable to be estimated.	1–3	>5	0–12	Silt loam	ML, CL–ML	A–4	
			12–23	Silt loam, silty clay loam.	CL, CL–ML	A–6, A–7	
			23–56	Clay loam, loam (fragipan).	CL	A–6	
			56–97	Clay loam, gravelly loam.	CL	A–6	0–5
Russell: RuB	>3	>5	0–11	Silt loam	ML, CL–ML	A–4	
			11–26	Silty clay loam, silt loam.	CL, CL–ML	A–6, A–7	
			26–82	Silt loam, loam, clay loam.	ML, CL	A–6, A–4	0–5
Sardinia: SaA, SaB, SaC2	1–3	>5	0–9	Silt loam	ML	A–4	
			9–71	Silty clay loam, clay loam, silt loam, loam.	CL	A–6, A–7	
			71–85	Gravelly sandy clay loam.	SC, GC, CL	A–2, A–6, A–4	
Shoals: Sh	[2] ½–1½	>5	0–12	Silt loam	ML	A–4	
			12–62	Loam, silt loam, sandy loam.	ML, SM, CL–ML	A–4, A–2	
Sleeth: SlA	½–1½	>5	0–15	Silt loam	ML	A–4	
			15–43	Silty clay loam, silty clay.	CL	A–6, A–7	
			43–60	Gravelly clay, gravelly loam.	CL, GC	A–6, A–7	
			60–63	Sand and gravel.	GW, GM, SM, SP	A–1, A–2	0–10
Sloan: Sn	0–1	>5	0–38	Silt loam	ML	A–4	
			38–60	Sandy loam, loamy sand.	SM	A–2, A–4	
Stonelick: St	[2] >3	>5	0–14	Loam	ML	A–4	
			14–34	Sandy loam, loamy sand.	SM	A–2, A–4	
			34–60	Gravelly sand	SM, SP–SM	A–1, A–2	0–5
Thackery: ThA, ThB	1–3	>5	0–12	Silt loam	ML	A–4	
			12–30	Silty clay loam, clay loam.	CL	A–6, A–7	
			30–50	Gravelly sandy clay loam, gravelly clay loam.	SC, CL, GC	A–6	
			50–62	Sand and gravel.	GW, GM, SM, SP	A–1, A–2	0–5

See footnotes at end of table.

properties significant in engineering—Continued

Percentage passing sieve—				Permeability	Available water capacity	Reaction [1]	Shrink-swell potential	Corrosivity	
No. 4 (4.7 mm)	No. 10 (2.0 mm)	No. 40 (0.42 mm)	No. 200 (0.074 mm)					Uncoated steel	Concrete
				In per hr	*In per in of soil*	*pH*			
95–100	90–100	80–95	70–90	0. 6–2. 0	0. 19–0. 23	6. 1–8. 4	Low	Low	Low.
95–100	90–100	75–90	60–85	0. 6–2. 0	0. 14–0. 18	6. 1–8. 4	Low	Low	Low.
50–80	40–70	35–60	12–45	>2. 0	0. 04–0. 08	6. 1–8. 4	Low	Low	Low.
100	95–100	85–100	75–95	0. 6–2. 0	0. 17–0. 21	4. 5–6. 5	Low	Moderate	Moderate.
95–100	95–100	90–100	80–95	0. 6–2. 0	0. 13–0. 17	4. 5–5. 5	Moderate	High	High.
95–100	90–100	80–95	70–80	0. 06–0. 6	0. 09–0. 13	4. 5–5. 5	Low	High	High.
80–100	70–95	65–90	60–80	0. 2–0. 6	0. 09–0. 13	5. 6–7. 8	Low	High	Moderate to low.
100	95–100	85–100	75–95	0. 6–2. 0	0. 07–0. 21	5. 1–6. 0	Low	Low	Moderate.
95–100	90–100	85–100	80–95	0. 6–2. 0	0. 14–0. 18	4. 5–6. 5	Moderate	High	High.

Table 5.—*Estimated soil properties*

Soil series and map symbols	Depth to—		Depth from surface	Dominant USDA texture	Classification		Coarse fraction larger than 3 inches
	Seasonal high water table	Bedrock			Unified	AASHTO	
	Feet	*Feet*	*In*				*Percent*
*Trappist: TrE, TsB, TsC2, TsD2—For Muse parts of TsB, TsC2, and TsD2, see Muse series.	>3	2–3	0–6	Silt loam	ML, CL–ML	A–4	
			6–14	Silty clay loam.	CL, CH	A–6, A–7	
			14–32	Very shaly silty clay loam, shaly silty clay.	GC, CL	A–6, A–7	0–20
			32	Black fissile shale bedrock.			
Tuscarawas: TuD, TuF	>3	3–6	0–15	Channery silt loam.	ML, CL–ML	A–4	0–20
			15–36	Channery clay loam.	CL	A–6, A–7	5–40
			36–60	Silty clay	CL, CH	A–7	0–5
Warsaw: WaA	>3	>5	0–16	Silt loam, loam	ML, CL–ML	A–4	
			16–28	Gravelly clay loam.	CL	A–6, A–7	
			28–60	Sand and gravel.	GW, GM, SM, SP	A–1, A–2	0–5
Wea: WeA, WeB	>3	>5	0–16	Silt loam, loam	ML, CL–ML	A–4	
			16–48	Clay loam, gravelly clay loam.	CL	A–6, A–7	
			48–60	Sand and gravel.	GW, GM, SM, SP	A–1, A–2	0–5
Wellston: WIC, WID	>3	3–6	0–8	Silt loam	ML	A–4	
			8–38	Silty clay loam	CL, ML	A–6, A–4	
			38–44	Channery clay loam.	GC, CL, GM	A–6, A–4	0–10
			44	Sandstone bedrock.			
Westland: Ws, Wt	0–1	>5	0–11	Silt loam, silty clay loam.	ML, CL	A–4, A–6	
			11–48	Sandy clay loam, gravelly sandy loam.	SC, CL	A–6	
			48–62	Sand and gravel.	GW, GM, SM, SP	A–1, A–2	0–5
Williamsburg: WvA, WvB, WvC	>3	>5	0–12	Silt loam	ML	A–4	
			12–23	Silty clay loam, silt loam.	CL, ML	A–6, A–4	
			23–68	Sandy clay loam, sandy loam, loam.	SC, CL, SM	A–6, A–4, A–2	
			68–91	Loam	ML, SM, CL	A–4, A–6	
Xenia: XeB	1–3	>5	0–11	Silt loam	ML, CL–ML	A–4	
			11–28	Silty clay loam.	CL, CL–ML	A–6, A–7	
			28–54	Clay loam	CL	A–6	
			54–65	Loam	ML, CL	A–4, A–6	

[1] The reaction given for the surface layer represents the average pH of the surface layer. In many places, it is high because of limiting practices.

significant in engineering—Continued

Percentage passing sieve—				Permeability	Available water capacity	Reaction [1]	Shrink-swell potential	Corrosivity	
No. 4 (4.7 mm)	No. 10 (2.0 mm)	No. 40 (0.42 mm)	No. 200 (0.074 mm)					Uncoated steel	Concrete
				In per hr	*In per in of soil*	*pH*			
95–100	90–100	80–100	70–90	0. 6–2. 0	0. 16–0. 20	4. 5–6. 0	Low	Low	High.
90–100	90–100	80–95	75–90	0. 06–0. 2	0. 13–0. 17	4. 0–5. 5	Moderate	Moderate	High.
50–80	40–70	40–65	35–60	0. 06–0. 2	0. 11–0. 15	4. 0–5. 5	Moderate	Moderate	High.
85–100	75–95	70–90	60–80	0. 6–2. 0	0. 14–0. 18	5. 1–6. 5	Low	Moderate	Moderate.
80–95	70–90	60–80	50–70	0. 6–2. 0	0. 12–0. 16	4. 5–6. 0	Moderate	High	High.
90–100	85–100	80–90	75–85	0. 06–0. 2	0. 10–0. 14	4. 0–5. 0	Moderate	High	High.
90–100	85–100	75–95	60–85	0. 6–2. 0	0. 15–0. 19	5. 1–6. 5	Low	Low	Moderate.
70–95	65–90	60–80	55–70	0. 6–2. 0	0. 11–0. 15	5. 1–7. 3	Moderate	Moderate	Moderate to low.
40–70	25–65	15–50	0–35	>6. 0	0. 02–0. 08	6. 6–7. 8	Low	Low	Low.
90–100	85–100	80–95	65–85	0. 6–2. 0	0. 15–0. 19	5. 6–6. 5	Low	Low	Moderate.
70–95	65–90	60–85	55–75	0. 6–2. 0	0. 11–0. 15	5. 1–7. 3	Moderate	Moderate	Moderate to low.
40–70	25–65	15–50	0–35	>6. 0	0. 02–0. 08	6. 6–7. 8	Low	Low	Low.

TABLE 6.—*Interpretations of*

[An asterisk in the first column indicates that at least one mapping unit in this series is made up of two or more kinds of soil. The soils in the first column

Soil series and map symbols	Suitability for winter grading	Susceptibility to frost action	Suitability as a source of—		
			Topsoil	Sand and gravel	Road fill
Algiers: Ag	Poor: subject to flooding; seasonal high water table.	High	Good	Unsuited	Fair: low strength; seasonal high water table.
Atlas: AtB, AtB2, AtC2, AtC3	Poor: seasonal high water table; clayey material.	Moderate	Fair: thin layer of suitable material.	Unsuited	Poor: clayey material; high shrink-swell potential.

engineering properties of the soils

such mapping units may have different properties and limitations, and for this reason it is necessary to refer to other series as indicated in of this table]

Soil features affecting—						
Highway location	Pond		Drainage of crops and pasture	Sprinkler irrigation	Terraces or diversions	Grassed waterways
	Reservoir areas	Embankments				
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	Nearly level:	Nearly level:

TABLE 6.—*Interpretations of*

Soil series and map symbols	Suitability for winter grading	Susceptibility to frost action	Suitability as a source of—		
			Topsoil	Sand and gravel	Road fill
Bratton: BpB, BpB2, BpC2, BpD2, BrD3.	Fair: clayey material; limestone bedrock at a depth of 2 to 3½ feet.	Moderate	Fair: thin layer of suitable material.	Unsuited	Poor: low strength; bedrock at a depth of 2 to 3½ feet.
Brookston: Bs, Bt	Poor: high water table.	High	Good	Unsuited	Poor: clayey material; high water table.
Cana: CaB, CaC2, CaD2, CaF	Fair: depth less than 5 feet to shale bedrock; clayey materials below a depth of 3 feet.	Moderate	Fair: less than 16 inches of suitable material. Poor where slopes are more than 12 percent.	Unsuited	Poor: shale bedrock at a depth of less than 5 feet; low strength.
Casco: CcD3, CcF2	Good: well drained; gravelly material.	Low	Poor: gravelly textures; steep slopes.	Good below a depth of 2 feet.	Fair: good below a depth of 2 feet.
*Celina: CeB, CfB, CgA, CgB	Poor: seasonal high water	Moderate	Poor: thin layer	Unsuited	Fair: silty material; moderate

engineering properties of the soils—Continued

Soil features affecting—						
Highway location	Pond		Drainage of crops and pasture	Sprinkler irrigation	Terraces or diversions	Grassed waterways
	Reservoir areas	Embankments				
Low strength;	Slow seepage	Fair compaction	Well drained;	Slow permeabil-	Underlain with	Moderately

TABLE 6.—*Interpretations of*

Soil series and map symbols	Suitability for winter grading	Susceptibility to frost action	Suitability as a source of—		
			Topsoil	Sand and gravel	Road fill
*Colyer: CoD2, CoF, CoG. For Trappist parts, see Trappist series.	Poor: shale bedrock at a depth of 1 to 1½ feet.	Moderate	Poor: thin layer	Unsuited	Poor: shale bedrock at a depth of 1 to 1½ feet.
*Crosby: CrA, CsA, CsB, CuA. For Fincastle parts of CsA and CsB, see Fincastle series. Urban land part of CuA is too variable for interpretations.	Poor: seasonal high water table.	High	Fair: thin layer	Unsuited	Fair: silty material; moderate shrink-swell potential.
Dana: DaA, DaB	Poor: seasonal high water table at a depth of 2 to 3 feet.	High	Fair: less than 16 inches of suitable material.	Unsuited	Fair: silty material; moderate shrink-swell potential.
Dubois: DuA, DuB	Poor: seasonal high water table.	High	Fair: 15 inches thick.	Unsuited	Fair: loamy and silty material.
Edenton: EbC2, EbD2, EbF2	Fair: clayey subsoil; bedrock at a depth of 2 to 3½ feet.	Moderate	Poor: thin layer; too sloping.	Unsuited	Poor: clayey material; bedrock at a depth of 2 to 3½ feet.
Eel: Ee	Poor: subject to flooding; seasonal high water table at a depth of 2 to 3 feet.	High	Good	Unsuited	Fair: silty material.
Fincastle. Mapped only in complexes with Crosby soils.	Poor: seasonal high water table.	High	Fair: less than 16 inches of suitable material.	Unsuited	Poor: silty material; moderate shrink-swell potential.

engineering properties of the soils—Continued

Highway location	Soil features affecting— Pond		Drainage of crops and pasture	Sprinkler irrigation	Terraces or diversions	Grassed waterways
	Reservoir areas	Embankments				
Shale bedrock at a depth of 1 to 1½ feet; some steeply sloping areas.	Shale bedrock at a depth of 1 to 1½ feet; moderately slow seepage rate.	Fair stability; slow permeability when compacted; slight piping hazard.	Not needed; shale bedrock at a shallow depth.	Moderate infiltration rate; low available water capacity; sloping to very steep slopes.	Shale bedrock at a depth of 1 to 1½ feet; most areas are too sloping.	Low available water capacity; sloping to very steep slopes.
Seasonal high water table; silty material may flow when wet; high frost heave potential.	Slow seepage rate; seasonal high water table.	Fair stability and compaction characteristics; slow seepage rate.	Slow permeability; seasonal high water table.	Medium to slow infiltration rate; medium available water capacity.	Seasonal high water table.	Slightly erodible; seasonal high water table.
Fair stability; silty material	Moderate seep-	Fair stability;	Moderately well	Moderate infil-	Soil properties	Slightly erodible.

TABLE 6.—*Interpretations of*

	Suitability for	Susceptibility	Suitability as a source of—		

engineering properties of the soils—Continued

Soil features affecting—						
Highway location	Pond		Drainage of crops and pasture	Sprinkler irrigation	Terraces or diversions	Grassed waterways
	Reservoir areas	Embankments				
Fair to good	Moderately slow	Fair to good	Moderately slow	Moderate in fi	Seasonal high	Slightly good

TABLE 6.—*Interpretations of*

Soil series and map symbols	Suitability for winter grading	Susceptibility to frost action	Suitability as a source of—		
			Topsoil	Sand and gravel	Road fill
*Hennepin: HeF2, HeG2, HfE3. For Miamian parts, see Miamian series.	Fair to good: loamy material in substrata.	Low	Poor: thin layer; steep slopes.	Unsuited	Fair: silty and loamy materials.
Hickory: HkC2, HkD2, HkE2, HkF2, HyC3, HyD3, HyE3.	Fair to good compaction properties; water table below a depth of 3 feet.	High	Poor: thin layer.	Unsuited	Fair: silty material; moderate shrink-swell potential.
Jessup: JeD	Fair: high silt and clay content in the subsoil.	Moderate	Fair: thin layer.	Unsuited	Poor: silty and clayey materials; low strength.
Johnsburg: JoC	Poor: seasonal high water table.	High	Fair: less than 16 inches of suitable material.	Unsuited	Poor: silty material.
Kendallville: KeB, KeC2, KeD2, KfD3	Fair: well drained; clay loam in subsoil.	Low	Poor: thin layer.	Unsuited	Fair: loamy material in upper 3 feet.
Lawshe: LhB, LhC2, LhD2, LlD3	Poor: clayey materials.	Moderate	Poor: too clayey.	Unsuited	Poor: high shrink-swell

engineering properties of the soils—Continued

Soil features affecting—						
Highway location	Pond		Drainage of crops and pasture	Sprinkler irrigation	Terraces or diversions	Grassed waterways
	Reservoir areas	Embankments				
Fair stability; steep slopes; cuts are droughty.	Slow seepage rate; steep slopes limit storage capacity.	Fair stability; slight piping hazard.	Not needed; steep slopes.	Moderate infiltration rate; low available water capacity; steep slopes.	Steep slopes; droughty soil.	Steep slopes; droughty soil.
High frost heave potential;	Moderate permeability.	Fair to good compaction	Moderate permeability;	Medium to high available water	Sloping to very steep slopes.	Sloping to very steep slopes.

TABLE 6.—*Interpretations of*

Soil series and map symbols	Suitability for winter grading	Susceptibility to frost action	Suitability as a source of—		
			Topsoil	Sand and gravel	Road fill
McGary: MgB	Poor: seasonal high water table; clayey subsoil.	Moderate	Fair: thin layer.	Unsuited	Poor: silty and clayey material; seasonal high water table.
*Miamian: MIB, MIB2, MIC2, MID2, MIE, MmC3, MrB, MrB2, MrC2, MsB. For Russell parts of MrB, MrB2, and MrC2, see Russell series. Urban land part of MsD is too variable for interpretations.	Poor: high silt and clay content in the subsoil.	Moderate	Poor: thin layer; some steep slopes.	Unsuited	Fair: silty and clayey material.
Millsdale: Mt	Poor: high water table; hard bedrock at a depth of less than 4 feet.	High	Poor: high water table.	Unsuited	Poor: clayey materials; high shrink-swell potential; high water table.
Milton: MuB, MuB2, MuC2, MuD2, MwC3.	Poor: high silt and clay content in the subsoil; limestone bedrock at a depth of less than 4 feet.	Moderate	Fair: thin layer.	Unsuited	Fair: silty and clayey material; bedrock at a depth of less than 4 feet.
Montgomery: My	Poor: high water table.	Moderate	Poor: high water table.	Unsuited	Poor: clayey material; high water table.
Muse Mapped only in complexes with Trappist soils.	Poor: high clay content in subsoil.	Moderate	Fair: thin layer.	Unsuited	Poor: clayey materials.
Muskingum Mapped only in complexes with Rarity	Poor: bedrock at a depth of less	Low	Poor: thin layer	Unsuited	Fair: silty and loam material.

engineering properties of the soils—Continued

Highway location	Soil features affecting— Pond		Drainage of crops and pasture	Sprinkler irrigation	Terraces or diversions	Grassed waterways
	Reservoir areas	Embankments				
Fair stability; moderate frost heave potential; seasonal high water table.	Very slow seepage rate; seasonal high water table.	Fair stability; very slow seepage rate.	Very slow permeability; seasonal high water table.	Moderate to slow infiltration rate; very slow permeability; medium available water capacity.	Very slow permeability.	Very slow permeability.
Fair to good stability; some frost heaving.	Slow seepage rate.	Fair to good stability and compaction characteristics; slow permeability when compacted; good core material.	Not needed; moderately slow permeability.	Moderate infiltration rate; medium available water capacity.	Some steep slopes.	Moderately to highly erodible; some steep slopes.
High water table; plastic	Slow seepage rate; bedrock	Poor stability and compac-	Very poorly drained; mod-	Slow infiltration rate; high	Very poorly drained;	Slightly erodible; high water

TABLE 6.—*Interpretations of*

	Suitability for	Susceptibility	Suitability as a source of—		

engineering properties of the soils—Continued

Soil features affecting—						
Highway location	Pond		Drainage of crops and pasture	Sprinkler irrigation	Terraces or diversions	Grassed waterways
	Reservoir areas	Embankments				
Good stability; easy to work; low frost heave potential; some steep slopes.	High seepage rate; sandy and gravelly material.	Fair to good stability and compaction characteristics; subject to excessive seepage.	Not needed	High infiltration rate; medium available water capacity.	Soil properties favorable; some steep slopes.	Medium available water capacity; some steep slopes.
Bedrock at a depth of 3½	Medium to high seepage rate;	Fair stability; moderate per-	Not needed	Medium to high infiltration	Sloping to very steep.	Sloping to very steep.

TABLE 6.—*Interpretations of*

Soil series and map symbols	Suitability for winter grading	Susceptibility to frost action	Suitability as a source of—		
			Topsoil	Sand and gravel	Road fill
Philo: Pn	Poor: subject to flooding; seasonal high water table at a depth of 1 to 3 feet.	High	Good	Unsuited	Fair: loamy material.
Ross: Rn	Poor: subject to flooding.	Moderate	Good	Unsuited	Fair: silty material.
Rossmoyne: RpA, RpB, RpB2, RpC2, RpD2, RsC3, RtB. Urban land part of RtB is too variable for interpretations.	Fair: seasonal high water table at a depth of 1 to 3 feet.	Moderate	Fair: less than 16 inches of suitable material.	Unsuited	Fair: moderate stability; low shrink-swell potential; easy to compact; erodible on slopes.
Russell: RuB	Fair: silty and clayey material.	Moderate	Fair: less than 16 inches of suitable material.	Unsuited	Fair: silty material.
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

engineering properties of the soils—Continued

Soil features affecting—						
Highway location	Pond		Drainage of crops and pasture	Sprinkler irrigation	Terraces or diversions	Grassed waterways
	Reservoir areas	Embankments				
Subject to flooding; low	Subject to stream over-	Fair stability and compac-	Moderately well drained; sub-	Moderate infiltration rate;	Nearly level; subject to	Nearly level; subject to

TABLE 6.—*Interpretations of*

Soil series and map symbols	Suitability for winter grading	Susceptibility to frost action	Suitability as a source of—		
			Topsoil	Sand and gravel	Road fill
Thackery: ThA, ThB	Fair: seasonal high water table at a depth of 1 to 3 feet.	Moderate	Fair: less than 16 inches of suitable material.	Fair: good below a depth of 4 feet.	Fair: silty and loamy material. Good below a depth of 4 feet.
*Trappist: TrE, TsB, TsC2, TsD2. For Muse parts of TsB, TsC2, and TsD2, see Muse series.	Fair: silty and clayey material; shale bedrock at a depth of 2 to 3 feet.	Moderate	Poor: thin layer.	Unsuited	Poor: silty and clayey material; bedrock at a depth of 2 to 3 feet.
Tuscarawas: TuD, TuF	Fair: clayey substratum.	High	Poor: channery texture.	Unsuited	Poor: clayey substratum; low strength.
Warsaw: WaA	Good: well drained gravelly material.	Low	Good	Good	Good: gravelly material.
Wea: WeA, WeB	Good: well drained; sandy and gravelly material.	Low	Good	Good below a depth of 4 feet.	Good: loamy and gravelly material.
Wellston: WlC, WlD	Fair: well drained; silty and loamy material; bedrock at a depth of 3 to 6 feet.	Moderate	Fair: thin layer.	Unsuited	Fair: silty and loamy material; sandstone and shale bedrock at a depth of 3 to 6 feet.
Westland: Ws, Wt	Poor: high water table.	High	Poor: high water table.	Fair to good below a depth of 4 feet.	Poor: high water table.
Williamsburg: WvA, WvB, WvC	Poor: silty and clayey material in subsoil.	Low	Fair: poor if slope is more than 12 percent.	Unsuited: possible source at greater depth.	Fair: silty and loamy material.
Xenia: XeB	Poor: high content of silt and clay in subsoil; seasonal high water table at a depth of 1 to 3 feet.	High	Fair: less than 16 inches of suitable material.	Unsuited	Poor: silty material.

engineering properties of the soils—Continued

Soil features affecting—						
Highway location	Pond		Drainage of crops and pasture	Sprinkler irrigation	Terraces or diversions	Grassed waterways
	Reservoir areas	Embankments				
Good stability; good source	Moderate to high seepage rate;	Good stability; moderate to	Moderately well drained; mod	Moderate infiltration rate;	Soil properties favorable	Moderately erodible

and the workability and quantity of cut and fill material available. The AASHTO and Unified classifications of the soil material and the shrink-swell potential indicate traffic supporting capacity. Wetness and flooding affect stability of the material. Slope, depth to hard rock, content of stones and rocks, and wetness affect ease of excavation and amount of cut and fill needed to reach an even grade.

Pond reservoir areas hold water behind a dam or embankment. Soils suitable for pond reservoir areas have low seepage, which is related to their permeability and depth to fractured or permeable bedrock or other permeable material.

Embankments require soil material resistant to seepage and piping and of favorable stability shrink-swell potential, shear strength, and compactibility. Presence of stones or organic material in a soil are among factors that are unfavorable.

Drainage of crops and pasture is affected by such soil properties as permeability, texture, and structure; depth to claypan, rock, or other layers that influence rate of water movement; depth to the water table; slope, stability in ditchbanks; susceptibility to stream overflow; salinity or alkalinity; and availability of outlets for drainage.

Irrigation of a soil is affected by such features as slope; susceptibility to stream overflow, water erosion or soil blowing; soil texture; content of stones; depth of root zone; rate of water intake at the surface; permeability of other layers that restrict movement of water; amount of water held available to plants; and need for drainage, or depth to water table or bedrock.

Terraces and diversions are embankments, or ridges, constructed across the slope to intercept runoff and seepage so that it soaks into the soil or flows slowly to a prepared outlet. Features that affect suitability of a soil for terraces are uniformity and steepness of slope; depth to bedrock or other unfavorable material; presence of stones; permeability; and resistance to water erosion, soil slipping, and soil blowing. A soil suitable for these structures provides outlets for runoff and is not difficult to vegetate.

The layout and construction of grassed waterways are affected by such soil properties as texture, depth, and erodibility of the soil material; presence of stones or rock outcrops; and the steepness of slopes. Other factors that affect waterways are seepage, natural soil drainage, available water capacity, susceptibility to siltation and the ease of establishing and maintaining vegetation.

Soil and Land Use Planning for Town and Country Development

Most of Highland County has been used for farming in the past, but large areas are now used for residential, commercial, industrial, transportation, and recreation (fig. 2) purposes. A large part of the county is presently idle or is used for nonfarm activities.

This section provides information about the properties

It can help community planners and industrial users of land find areas that are least costly to develop and maintain. Land use planners can find other information in the detailed soil maps. Table 7 gives the estimated degree and kinds of limitations of soils for some land uses. Because extensive manipulation of the soil alters some of its natural properties, the ratings for some uses will not apply to areas that have undergone extensive cutting and filling.

The estimated degree of limitations of the soils for a land use are described as slight, moderate, and severe. A rating of *slight* indicates that the soil has no important limitations for the use. *Moderate* shows that the soil has some limitations, but they can be overcome or corrected. *Severe* indicates that the soil has serious limitations that are costly and difficult to overcome.

Following are explanations of some of the columns in table 7.

[redacted]

open ditch drains have been installed for agricultural uses. Excavations in these areas for buildings can disrupt this drainage system.

Some soils, such as Avonburg or Clermont soils, have a high content of silt. They are not as suitable for supporting structural foundations as the coarser textured Fox and Ockley soils. A high shrink-swell property can cause foundations to heave and crack, and it can affect the alinement of sidewalks, patios, floors, and rock walls. A subgrade or layers of sandy or gravelly material below the structure can overcome this limitation.

Excavating basements and installing underground utility lines is difficult and expensive in soils that have a limited depth to bedrock. Areas where the slope is more than 12 percent have an erosion hazard as well as limitations for excavating and leveling.

Local roads and streets.—The ratings in table 7 are for

TABLE 7.—*Degree and kind of limitations of the*

Soil series and map symbols	Cultivated crops	Septic tank absorption fields	Sewage lagoons	Dwellings		Local roads and streets
				With basement	Without basement	
Algiers: Ag	Slight	Severe: subject to flooding.	Severe: subject to flooding.	Severe: subject to flooding; seasonal high water table.	Severe: subject to flooding.	Severe: subject to flooding; highly susceptible to frost action.
Atlas: AtB, AtB2	Moderate: wetness.	Severe: very slow permeability; seasonal high water table.	Moderate: slope.	Severe: seasonal high water table; high shrink-swell potential.	Severe: high shrink-swell potential.	Severe: high shrink-swell potential; low strength.
AtC2, AtC3	Severe: slope; hazard of erosion.	Severe: very slow permeability; seasonal high water table.	Severe: slope	Severe: seasonal high water table; high shrink-swell potential.	Severe: high shrink-swell potential.	Severe: high shrink-swell potential; low strength.
Avonburg: AvA, AxA	Moderate: wetness.	Severe: very slow permeability	Slight	Severe: seasonal high	Moderate: seasonal high	Moderate: seasonal high
Urban land part of						

soils for town and country development

Shallow excavations	Sanitary landfill (trench) [1]	Lawns, landscaping, and golf fairways	Playgrounds	Picnic areas	Camp areas	Paths and trails
Severe: sub-	Severe: sub-	Severe: sub-	Severe: sub-	Moderate: sub-	Severe: sub-	Moderate: see-

TABLE—7. *Degree and kind of limitations of the*

Soil series and map symbols	Cultivated crops	Septic tank absorption fields	Sewage lagoons	Dwellings		Local roads and streets
				With basement	Without basement	
Boston:						

soils for town and country development—Continued

Shallow excavations	Sanitary landfill (trench) [1]	Lawns, landscaping, and golf fairways	Playgrounds	Picnic areas	Camp areas	Paths and trails
Moderate: depth to rock; slope.	Severe: depth to rock.[2]	Moderate: moderately slow permeability; slope.	Severe: slope	Moderate: slope.	Moderate: moderately slow permeability; slope.	Slight.
Severe: slope	Severe: depth to rock.[2]	Severe: slope	Severe: slope	Severe: slope	Severe: slope	Moderate: slope.
Moderate: depth to rock.	Severe: depth to rock.[2]	Moderate: medium available	Moderate: slope; moderate	Slight	Slight; moderate for Boston	Slight.

TABLE—7. *Degree and kind of limitations of the*

Soil series and map symbols	Cultivated crops	Septic tank absorption fields	Sewage lagoons	Dwellings		Local roads and street
				With basement	Without basement	
Casco:						
CcD3	Severe: slope; erosion.	Severe: slope [2]	Severe: slope; moderately rapid permeability.[2]	Severe: slope	Severe: slope	Severe: slope
CcF2	Severe: slope; erosion.	Severe: slope [2]	Severe: slope; moderately rapid permeability.[2]	Severe: slope	Severe: slope	Severe: slope
Celina:						
CeB, CfB, CgB. Urban land part of CfB is too variable to be rated. For Xenia part of CgB, see XeB in Xenia	Slight	Severe: moderately slow permeability.	Slight	Moderate: seasonal high water table.	Slight	Moderate: subject to frost action.

soils for town and country development—Continued

Shallow excavations	Sanitary landfill (trench) [1]	Lawns, landscaping, and golf fairways	Playgrounds	Picnic areas	Camp areas	Paths and trails
Severe: slope	Severe: moderately rapid permeability.[2]	Severe: slope; low available water capacity.	Severe: slope	Severe: slope	Severe: slope	Moderate: slope.
Severe: slope	Severe: moderately rapid permeability; slope.[2]	Severe: slope; low available water capacity.	Severe: slope	Severe: slope	Severe: slope	Severe: slope.

TABLE 7.—*Degree and kind of limitations of the*

Soil series and map symbols	Cultivated crops	Septic tank absorption fields	Sewage lagoons	Dwellings		Local roads and streets
				With basement	Without basement	
Crosby: CrA, CsA, CuA. Urban land part of CuA is too variable to be rated. Crosby part	Slight	Severe: slow permeability; seasonal high water table.	Slight	Severe: seasonal high water table.	Moderate: seasonal high water table.	Severe: subject to frost action.
Fincastle part of CsA	Slight	Severe: moderately slow	Slight	Severe: seasonal high	Moderate: seasonal high	Severe: subject to frost

soils for town and country development—Continued

Shallow excavations	Sanitary landfill (trench) [1]	Lawns, landscaping, and golf fairways	Playgrounds	Picnic areas	Camp areas	Paths and trails
Severe: seasonal high water table.	Moderate: seasonal high water table.	Severe: slow permeability.	Moderate: slow permeability; seasonal high water table.	Moderate: seasonal high water table.	Moderate: slow permeability; seasonal high water table.	Moderate: seasonal high water table.

TABLE—7. *Degree and kind of limitations of the*

Soil series and map symbols	Cultivated crops	Septic tank absorption fields	Sewage lagoons	Dwellings		Local roads and streets
				With basement	Without basement	
Edenton:						

soils for town and country development—Continued

Shallow excavations	Sanitary landfill (trench) [1]	Lawns, landscaping, and golf fairways	Playgrounds	Picnic areas	Camp areas	Paths and trails
Severe: clayey layers.	Severe: depth to bedrock; clayey layers.	Moderate: depth to bedrock.	Severe: slope	Moderate: slope.	Moderate: slope; moderately slow permeability.	Slight.
Severe: slope; clayey layers.	Severe: depth to bedrock; clayey layers.	Severe: slope	Severe: slope	Severe: slope	Severe: slope	Moderate: slope.
Severe: clayey layers; slope.	Severe: depth to bedrock; clayey layers; slope.	Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe: slope.
Severe: subject to flooding	Severe: subject to flooding.	Moderate: subject to flooding.	Moderate: subject to flooding.	Moderate: subject to flooding.	Severe: subject to flooding.	Slight.
Severe: seasonal high water table.	Moderate: seasonal high water table.	Moderate: moderately slow permeability; seasonal high water table.	Severe: seasonal high water table.	Moderate: seasonal high water table.	Severe: seasonal high water table.	Moderate: seasonal high water table.
Moderate: slope; gravelly subsoil.	Severe: permeable substratum.[2]	Moderate: slope.	Severe: slope	Moderate: slope.	Moderate: slope.	Slight.
Severe: slope	Severe: permeable substratum; slope.[2]	Severe: slope	Severe: slope	Severe: slope	Severe: slope	Moderate: slope.
Moderate: gravelly subsoil.	Severe: permeable substratum.[2]	Slight	Slight	Slight	Slight	Slight.
Moderate: gravelly subsoil.	Severe: permeable substratum.[2]	Slight	Moderate: slope.	Slight	Slight	Slight.
Moderate: slope; gravelly subsoil.	Severe: permeable substratum.[2]	Moderate: slope.	Severe: slope	Moderate: slope.	Moderate: slope.	Slight.
Severe: shallow to bedrock.	Severe: shallow to bedrock.	Severe: shallow to bedrock.	Severe: shallow to bedrock; slope.	Moderate: limestone fragments on surface.	Moderate: limestone fragments on surface.	Moderate: limestone fragments on surface.
Severe: shallow to bedrock; slope.	Severe: shallow to bedrock.[2]	Severe: shallow to bedrock; slope.	Severe: shallow to bedrock; slope.	Severe: slope	Severe: slope	Moderate: limestone fragments on surface.
Severe: shallow to bedrock; slope.	Severe: shallow to bedrock; slope.[2]	Severe: shallow to bedrock; slope.	Severe: shallow to bedrock; slope.	Severe: slope	Severe: slope	Severe: slope.
Severe: sub-	Severe: sub-	Severe: sub-	Severe: sub-	Moderate:	Severe: sub-	Moderate:

TABLE 7.—*Degree and kind of limitations of the*

Soil series and map symbols	Cultivated crops	Septic tank absorption fields	Sewage lagoons	Dwellings		Local roads and streets
				With basement	Without basement	
Guernsey:						
GuB	Slight	Severe: slow permeability.	Moderate: slope.	Severe: clayey subsoil; low strength.	Severe: clayey subsoil; low strength.	Severe: clayey subsoil; low strength.
GuC	Moderate: slope; erosion.	Severe: slow permeability.	Severe: slope	Severe: clayey subsoil; low strength.	Severe: clayey subsoil; low strength.	Severe: clayey subsoil; low strength.
GvC3	Severe: slope; erosion.	Severe: slow permeability.	Severe: slope	Severe: clayey subsoil; low strength.	Severe: clayey subsoil; low strength.	Severe: clayey subsoil; low strength.
GxD3	Severe: slope; erosion.	Severe: slow permeability; slope.	Severe: slope	Severe: clayey subsoil; low strength; slope.	Severe: clayey subsoil; low strength; slope.	Severe: clayey subsoil; low strength; slope.
Haubstadt:						
HbA	Slight	Severe: slow permeability.	Moderate: moderate permeability below a depth of 53 inches.	Moderate: seasonal high water table.	Slight	Moderate: subject to frost action.
HbB, HcB Urban land part of HcB is too variable to be rated.	Slight	Severe: slow permeability.	Moderate: moderate permeability below a depth of 53 inches; slope.	Moderate: seasonal high water table.	Slight	Moderate: subject to frost action.
HbC2, HcC Urban land part of HcC is too variable to be rated.	Moderate: slope; erosion.	Severe: slow permeability.	Severe: slope	Moderate: seasonal high water table; slope.	Moderate: slope.	Moderate: subject to frost action; slope.
HbC3	Severe: slope; erosion.	Severe: slow permeability.	Severe: slope	Moderate: seasonal high water table; slope.	Moderate: slope.	Moderate: subject to frost action; slope.
HbD2, HbD3	Severe: slope; erosion.	Severe: slow permeability; slope.	Severe: slope	Severe: slope	Severe: slope	Severe: slope.
Hennepin: Ratings are for both Hennepin and Miamian soils.						
HeF2, HeG2	Severe: slope; erosion.	Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe: slope.
HfE3	Severe: slope; erosion.	Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe: slope.

See footnotes at end of table.

soils for town and country development—Continued

Shallow excavations	Sanitary landfill (trench) [1]	Lawns, landscaping, and golf fairways	Playgrounds	Picnic areas	Camp areas	Paths and trails
Moderate: moderately well drained.	Severe: clayey layers; hard to pack.	Severe: slow permeability.	Moderate: slope; slow permeability.	Slight	Moderate: slow permeability; moderately well drained.	Slight.
Moderate: moderately well drained; slope.	Severe: clayey layers; hard to pack.	Severe: slow permeability.	Severe: slope	Moderate: slope.	Moderate: slow permeability; moderately well drained.	Slight.
Moderate: moderately well drained; slope.	Severe: clayey layers; hard to pack.	Severe: slow permeability.	Severe: slope	Moderate: slope.	Moderate: slow permeability; moderately well drained; slope.	Slight.
Severe: slope	Severe: clayey layers; hard to pack.	Severe: slow permeability; slope.	Severe: slope	Severe: slope	Severe: slope	Moderate: slope.
Moderate: seasonal high water table.	Slight	Severe: slow permeability.	Moderate: slow permeability; seasonal high water table.	Slight	Moderate: slow permeability; seasonal high water table.	Slight.
Moderate: seasonal high water table.	Slight	Severe: slow permeability.	Moderate: slow permeability; seasonal high water table; slope.	Slight	Moderate: slow permeability; seasonal high water table.	Slight.
Moderate: seasonal high water table; slope.	Slight	Severe: slow permeability.	Severe: slope	Moderate: slope.	Moderate: slow permeability; seasonal high water table; slope.	Slight.
Moderate: seasonal high water table; slope.	Slight	Severe: slow permeability.	Severe: slope	Moderate: slope.	Moderate: slow permeability; seasonal high water table; slope.	Slight.
Severe: slope	Moderate:	[illegible]	[illegible]	[illegible]	[illegible]	Moderate:

TABLE 7.—*Degree and kind of limitations of the*

Soil series and map symbols	Cultivated crops	Septic tank absorption fields	Sewage lagoons	Dwellings		Local roads and street
				With basement	Without basement	
Hickory: HkC2	Moderate:	Moderate:	Severe: slope	Moderate:	Moderate:	Severe: sub-

[redacted]

Shallow excavations	Sanitary landfill (trench) [1]	Lawns, landscaping, and golf fairways	Playgrounds	Picnic areas	Camp areas	Paths and trails
Moderate: slope.	Moderate: slightly sticky.	Moderate: slope.	Severe: slope	Moderate: slope.	Moderate: slope.	Slight.
Severe: slope	Moderate: slightly sticky; slope.	Severe: slope	Severe: slope	Severe: slope	Severe: slope	Moderate: slope.
Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe: slope.
Moderate: slope.	Moderate: slightly sticky.	Moderate: slope.	Severe: slope	Moderate: slope.	Moderate: slope.	Slight.
Severe: slope; clayey subsoil.	Severe: clayey layers.	Severe: slow permeability; slope.	Severe: slope	Severe: slope	Severe: slope	Moderate: slope.
Severe: seasonal high water table.	Moderate: seasonal high water table.	Severe: very slow permeability.	Severe: very slow permeability.	Moderate: seasonal high water table.	Severe: very slow permeability.	Moderate: seasonal high water table.
Slight	Slight	Moderate: moderately slow permeability.	Moderate: moderately slow permeability; slope.	Slight	Moderate: moderately slow permeability.	Slight.
Moderate: slope.	Slight	Moderate: moderately slow permeability; slope.	Severe: slope	Moderate: slope.	Moderate: moderately slow permeability; slope.	Slight.
Severe: slope	Moderate: slope.	Severe: slope	Severe: slope	Severe: slope	Severe: slope	Moderate: slope.

TABLE 7.—*Degree and kind of limitations of the*

Soil series and map symbols	Cultivated crops	Septic tank absorption fields	Sewage lagoons	Dwellings		Local roads and streets
				With	Without	

soils for town and country development—Continued

Shallow excavations	Sanitary landfill (trench) [1]	Lawns, landscaping, and golf fairways	Playgrounds	Picnic areas	Camp areas	Paths and trails
Severe: clayey subsoil.	Severe: clayey material.	Severe: slow permeability.	Moderate: slow permeability; slope.	Slight	Moderate: slow permeability.	Slight.
Severe: clayey subsoil.	Severe: clayey material.	Severe: slow permeability.	Severe: slope	Moderate: slope.	Moderate: slope; slow permeability.	Slight.
Severe: clayey subsoil; slope.	Severe: clayey material.	Severe: slow permeability; slope.	Severe: slope	Severe: slope	Severe: slope	Moderate: slope.
Severe: clayey subsoil; seasonal high water table.	Severe: clayey material.	Severe: slow permeability.	Severe: seasonal high water table; slow permeability.	Moderate: seasonal high water table.	Severe: seasonal high water table; slow permeability.	Moderate: seasonal high water table.
Slight	Slight	Moderate: moderately slow permeability.	Moderate: moderately slow permeability; slope.	Slight	Moderate: moderately slow permeability.	Slight.
Moderate: slope.	Slight	Moderate: moderately slow permeability; slope.	Severe: slope	Moderate: slope.	Moderate: moderately slow permeability; slope.	Slight.
Moderate: slope.	Slight	Moderate: slope.	Severe: slope	Moderate: slope.	Moderate: slope.	Slight.
Severe: slope	Moderate: slope.	Severe: slope	Severe: slope	Severe: slope	Severe: slope	Moderate: slope.
Moderate: slope.	Slight	Moderate: moderately slow permeability; slope.	Severe: slope	Moderate: slope.	Moderate: moderately slow permeability; slope.	Moderate: clay loam surface layer.
Severe: high water table; limited depth to bedrock.	Severe: high water table; limited depth to bedrock.[2]	Severe: high water table.	Severe: high water table.	Severe: high water table.	Severe: high water table.	Severe: high water table.

TABLE 7.—*Degree and kind of limitations of the*

Soil series and map symbols	Cultivated crops	Septic tank absorption fields	Sewage lagoons	Dwellings		Local roads and streets
				With basement	Without basement	
Milton: MuB, MuB2	Slight	Severe: limited depth to bedrock; moderately slow permeability.[2]	Severe: limited depth to bedrock.[2]	Severe: limited depth to bedrock.	Severe: low strength.	Severe: low strength.
MuC2	Moderate: slope;	Severe: limited depth	Severe: limited depth	Severe: limited depth	Severe: low strength.	Severe: low strength.

soils for town and country development—Continued

Shallow excavations	Sanitary landfill (trench) [1]	Lawns, landscaping, and golf fairways	Playgrounds	Picnic areas	Camp areas	Paths and trails
Severe: limited	Svere: limited	Moderate:	Moderate:	Slight	Moderate: moderately	Slight.

TABLE 7.—*Degree and kind of limitations of the*

Soil series and map symbols	Cultivated crops	Septic tank absorption fields	Sewage lagoons	Dwellings		Local roads and streets
				With basement	Without basement	
Ockley: OcA	Slight	Slight [2]	Moderate: moderate permeability.[2]	Slight	Slight	Moderate: silty upper part of subsoil.
OcB, OdB	Slight	Slight [2]	Moderate: moderate	Slight	Slight	Moderate: silty upper
Urban land part of						

soils for town and country development—Continued

Shallow excavations	Sanitary landfill (trench) [1]	Lawns, landscaping, and golf fairways	Playgrounds	Picnic areas	Camp areas	Paths and trails
Slight	Severe: rapid permeability in substratum.[2]	Slight	Slight	Slight	Slight	Slight.
Slight	Severe: rapid permeability in substratum.[2]	Slight	Moderate: slope.	Slight	Slight	Slight.
Slight	Severe: rapid permeability in substratum.[2]	Moderate: slope.	Severe: slope	Moderate: slope.	Moderate: slope.	Slight.
Severe: shallow to bedrock.	Severe: shallow to bedrock.[2]	Severe: shallow to bedrock.	Severe: slope; shallow to bedrock.	Moderate: slope.	Moderate: slope.	Slight.
Severe: shallow to bedrock; slope.	Severe: shallow to bedrock.[2]	Severe: shallow to bedrock; slope.	Severe: slope; shallow to bedrock.	Severe: slope	Severe: slope	Moderate: slope.
Severe: shallow to bedrock; stoniness; slope.	Severe: slope; shallow to bedrock; stoniness.[2]	Severe: shallow to bedrock; stoniness; slope.	Severe: slope; shallow to bedrock; stoniness.	Severe: slope	Severe: slope; stoniness.	Severe: slope; stoniness.
Severe: shallow to bedrock.	Severe: shallow to bedrock.[2]	Severe: shallow to bedrock; clay surface layer.	Severe: slope; shallow to bedrock; clay surface layer.	Severe: clay surface layer.	Severe: clay surface layer.	Severe: clay surface layer.
Slight	Severe: permeable substratum.[2]	Severe: very slow permeability.	Severe: very slow permeability.	Slight	Severe: very slow permeability.	Slight.
Moderate: slope.	Severe: permeable substratum.[2]	Severe: very slow permeability.	Severe: very slow permeability; slope.	Moderate: slope.	Severe: very slow permeability.	Slight.
Severe: slope	Severe: permeable substratum.[2]	Severe: very slow permeability; slope.	Severe: very slow permeability; slope.	Severe: slope	Severe: very slow permeability.	Moderate: slope.
Severe: slope	Severe: permeable substratum; slope.[2]	Severe: very slow permeability; slope.	Severe: very slow permeability; slope.	Severe: slope	Severe: very slow permeability; slope.	Severe: slope.
Severe: high	Severe: high	Severe: slow	Severe: high	Severe: high	Severe: high	Severe: high

TABLE 7.—*Degree and kind of limitations of the*

Soil series and map symbols	Cultivated crops	Septic tank absorption fields	Sewage lagoons	Dwellings		Local roads and streets
				With basement	Without basement	
Ross: Rn	Slight	Severe: subject to flooding.	Severe: subject to flooding.	Severe: subject to flooding.	Severe: subject to flooding.	Severe: subject to flooding; high frost action.
Rossmoyne: RpA	Slight	Severe: slow permeability.	Slight	Moderate: seasonal wetness.	Slight	Moderate: high silt content; moderate frost action.
RpB, RpB2, RtB	Slight	Severe: slow permeability.	Moderate: slope.	Moderate: seasonal	Slight	Moderate: high silt con-
Urban land part of						

soils for town and country development—Continued

Shallow excavations	Sanitary landfill (trench) [1]	Lawns, landscaping, and golf fairways	Playgrounds	Picnic areas	Camp areas	Paths and trails
Severe: subject to flooding.	Severe: subject to flooding.	Moderate: subject to flooding.	Moderate: subject to flooding.	Moderate: subject to flooding.[2]	Severe: subject to flooding.	Slight.
Moderate: seasonal wetness.	Moderate: high clay content in subsoil; seasonal wetness.	Moderate: slow permeability.	Moderate: slow permeability; seasonal wetness.	Slight	Moderate: slow permeability; seasonal wetness.	Slight.
Moderate: seasonal wetness.	Moderate: high clay content in subsoil; seasonal wetness.	Moderate: slow permeability.	Moderate: slow permeability; seasonal wetness; slope.	Slight	Moderate: slow permeability; seasonal wetness.	Slight.
Moderate: seasonal wetness; slope.	Moderate: high clay content in subsoil; seasonal wetness.	Moderate: slow permeability; slope.	Severe: slope	Moderate: slope.	Moderate: slow permeability; seasonal wetness.	Slight.
Severe: slope	Moderate: high clay content in subsoil; seasonal wetness; slope.	Severe: slope	Severe: slope	Severe: slope	Severe: slope	Moderate: slope.
Moderate: seasonal wetness; slope.	Moderate: high clay content in subsoil; seasonal wetness.	Moderate: slow permeability; silty clay loam surface layer; slope.	Severe: slope	Moderate: slope; silty clay loam surface layer.	Moderate: slow permeability; seasonal wetness.	Moderate: silty clay loam surface layer.
Slight	Slight	Slight	Moderate: slope.	Slight	Slight	Slight.
Moderate: seasonal wetness.	Severe: permeable substratum.[2]	Slight	Moderate: seasonal wetness.	Slight	Moderate: seasonal wetness.	Slight.
Moderate: seasonal wetness.	Severe: permeable substratum.[2]	Slight	Moderate: seasonal wetness; slope.	Slight	Moderate: seasonal wetness.	Slight.
Moderate: seasonal wetness; slope.	Severe: permeable substratum.[2]	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: seasonal wetness.	Slight.
Severe: subject to flooding; seasonal high water table.	Severe: subject to flooding.	Severe: subject to flooding.	Severe: subject to flooding; seasonal high water table.	Moderate: subject to flooding; seasonal high water table.	Severe: subject to flooding; seasonal high water table.	Moderate: seasonal high water table.
Severe: seasonal high water table.	Severe: permeable substratum.[2]	Moderate: seasonal high water table.	Moderate: seasonal high water table.	Moderate: seasonal high water table.	Moderate: seasonal high water table.	Moderate: seasonal high water table.
Severe: high water table; subject to flooding.	Severe: subject to flooding; high water table.	Severe: high water table; subject to flooding.	Severe: high water table; subject to flooding.	Severe: high water table.	Severe: high water table; subject to flooding.	Severe: high water table.

TABLE 7.—*Degree and kind of limitations of the*

Soil series and map symbols	Cultivated crops	Septic tank absorption fields	Sewage lagoons	Dwellings		Local roads and street
				With basement	Without basement	
Stonelick: St	Slight	Severe: subject to flooding.	Severe: moderately rapid permeability; subject to flooding.	Severe: subject to flooding.	Severe: subject to flooding.	Severe: subject to flooding.
Thackery:						
ThA	Slight	Moderate: moderate permeability.[2]	Severe: permeable substratum.[2]	Moderate: seasonal wetness.	Slight	Moderate: moderate frost action.
ThB	Slight	Moderate: moderate permeability.[2]	Severe: permeable substratum.[2]	Moderate: seasonal wetness.	Slight	Moderate: moderate frost action.
Trappist:						
TrE, TsD2.						
Trappist part	Severe: slope;	Severe: slope; slow perme-	Severe: slope; depth to	Severe: slope; depth to	Severe: slope	Severe: slope; low strength.

soils for town and country development—Continued

Shallow excavations	Sanitary landfill (trench) [1]	Lawns, landscaping, and golf fairways	Playgrounds	Picnic areas	Camp areas	Paths and trails
Severe: subject to flooding.	Severe: moderately rapid permeability; subject to flooding.	Moderate: subject to flooding.	Moderate: subject to flooding.	Moderate: subject to flooding.	Severe: subject to flooding.	Slight.
Moderate: seasonal wetness.	Severe: permeable substratum.[2]	Slight	Moderate: seasonal wetness.	Slight	Moderate: seasonal wetness.	Sllght.
Moderate: seasonal	Severe: permeable sub-	Slight	Moderate: seasonal	Slight	Moderate: seasonal	Slight.

TABLE 7.—*Degree and kind of limitations of the*

Soil series and map symbols	Cultivated crops	Septic tank absorption fields	Sewage lagoons	Dwellings		Local roads and streets
				With	[illegible]	

soils for town and country development—Continued

Shallow excavations	Sanitary landfill (trench) [1]	Lawns, landscaping, and golf fairways	Playgrounds	Picnic areas	Camp areas	Paths and trails
Moderate: gravelly layers.	Severe: permeable substratum.[2]	Slight	Slight	Slight	Slight	Slight.
Moderate: gravelly layers.	Severe: permeable substratum.[2]	Slight	Moderate: slope.	Slight	Slight	Slight.
Moderate: slope; depth to bedrock.	Severe: depth to bedrock.	Moderate: slope.	Severe: slope	Moderate: slope.	Moderate: slope.	Slight.
Severe: slope	Severe: depth to bedrock.	Severe: slope	Severe: slope	Severe: slope	Severe: slope	Moderate: slope.
Severe: high water table.	Severe: high water table.[2]	Severe: slow permeability; high water table.	Severe: high water table.	Severe: high water table.	Severe: high water table.	Severe: high water table.
Slight	Severe: substratum may be permeable.[2]	Slight	Slight	Slight	Slight	Slight.
Slight	Severe: substratum may be permeable.[2]	Slight	Moderate: slope.	Slight	Slight	Slight.
Moderate: slope.	Severe: substratum may be permeable.[2]	Moderate: slope.	Severe: slope	Moderate: slope.	Moderate: slope.	Slight.
Moderate: seasonal wetness.	Moderate: seasonal wetness; too clayey.	Moderate: moderately slow permeability.	Moderate: slope; moderately slow permeability; seasonal wetness.	Slight	Moderate: moderately slow permeability; seasonal wetness.	Slight.

[2] Pollutants can contaminate nearby wells, springs, lakes, or ponds, because filtration is not adequate.

Picnic areas.—Picnic and other extensive play areas can be located on many kinds of soils that have severe limitations for most other uses. Flood plains, for example, can be safely developed as extensive play areas. Many areas along streams are scenic and, because of their linear shape, can be used by a large number of people. Considered in rating these areas were the hazard of flooding, degree of stoniness and rockiness, degree of slope, texture of the surface soil, and depth to the water table.

Camp areas.—Sites for tents and trailers should be suitable for unsurfaced areas for cars and camping trailers. Properties to consider when selecting campsites are a hazard of flooding, seasonal high water table, permeability, slope, and soil texture. Wetness is the major factor that affects campsites. Soils that have a

true for the mapping units in that series. Thus, to get full information about any one mapping unit, it is necessary to read both the description of the mapping unit and the description of the soil series to which it belongs.

An important part of the description of each soil series is the soil profile, that is, the sequence of layers from the surface downward to rock or other underlying material. Each series contains two descriptions of this profile. The first is brief and in terms familiar to the layman. The second is much more detailed and is for those who need to make thorough and precise studies of soils. Color terms are for moist soil unless otherwise stated. The profile described in the series is representative for mapping units in that series. If the profile of a given mapping unit is different from the one described for the

TABLE 8.—*Approximate acreage and proportionate extent of the soils*—Continued

Soil	Acres	Percent	Soil	Acres	Percent
Celina-Urban land complex, gently sloping	153	(1)	Hennepin-Miamian complex, 12 to 25 percent slopes, severely eroded	3, 195	. 9
Celina-Xenia silt loams, 0 to 2 percent slopes	240	. 1			
Celina-Xenia silt loams, 2 to 6 percent slopes	12, 469	3. 5	Hickory silt loam, 6 to 12 percent slopes, moderately eroded	1, 741	. 5
Cincinnati silt loam, 2 to 6 percent slopes	1, 756	. 5			

TABLE 8.—*Approximate acreage and proportionate extent of the soils*—Continued

Soil	Acres	Percent	Soil	Acres	Percent
Milton clay loam, 6 to 12 percent slopes, severely eroded	160	(1)	Rossmoyne silt loam, 2 to 6 percent slopes, moderately eroded	6,085	1.7

Ap—0 to 7 inches, dark grayish brown (10YR 4/2) silt loam; weak, fine, subangular blocky structure; friable; many roots; 10 percent tubular pores; less than 5 percent

included areas have more than 30 inches of recent alluvium over the dark-colored buried horizon. Some included areas

patchy, grayish-brown (10YR 5/2) and brown (7.5YR 4/4) clay films on vertical and horizontal ped faces; thin, continuous, grayish-brown (2.5Y 5/2) silt coatings on vertical faces; 5 percent pebbles; very strongly acid; clear, wavy boundary.

areas and, in some places, is along small waterways. Areas are 2 to 40 acres in size. This soil has a profile similar to the one described as representative of the series, but more of the original surface layer is in place and, therefore, it is

plowing has mixed some of the fine-textured subsoil into the present surface layer. This has caused poorer tilth.

Included with this soil in mapping are gently sloping and sloping Rossmoyne soils that have a fragipan and lack the fine-textured subsoil material. Also included in some places are sloping and moderately steep Hickory soils that lack the clayey horizons in the subsoil and have carbonates at a depth of less than 36 inches. Some areas are underlain by limestone bedrock at a depth of 7 to 15 feet.

Erosion is the main limitation for farming. The very slow permeability in the subsoil is a limitation for some nonfarm uses. Capability unit IVe–3; woodland suitability group 2w2.

Avonburg Series

A2—9 to 15 inches, yellowish-brown (10YR 5/4) silt loam; common, medium, distinct, light brownish-gray (10YR 6/2) mottles; weak, thick, platy structure; friable; common fine roots; 30 percent tubular and vesicular pores; less than 5 percent pebbles; very strongly acid; gradual, wavy boundary.

B1—15 to 22 inches, yellowish-brown (10YR 5/4) silt loam; many, medium, distinct, light brownish-gray (10YR 6/2) mottles and few, medium, faint, yellowish-brown (10YR 5/6) mottles; weak, medium and fine, subangular blocky structure; friable; common fine roots; 15 percent tubular pores; 2 percent gray (10YR 5/1) krotovinas; less than 5 percent pebbles; very strongly acid; clear, wavy boundary.

B21t—22 to 31 inches, yellowish-brown (10YR 5/4) silt loam; many, medium, distinct, gray (10YR 6/1) mottles and common, fine, distinct, strong-brown (7.5YR 5/6) mottles; moderate, medium, subangular blocky structure; friable; common fine roots; 10 percent tubular pores; thin, very patchy, light brownish-gray (10YR 6/2) clay films on vertical and horizontal ped faces that are somewhat irregular and rounded; patchy

fragipan; it is very strongly acid to medium acid in the upper part of the B3 horizon and medium acid to neutral in the lower part of the B3 horizon.

The Ap or A1 horizon is grayish brown (10YR 5/2) to dark grayish brown (2.5Y 4/2). The B2 and Bx horizons are typically silty clay loam, but in some places are silt loam or clay loam.

Avonburg soils are part of the drainage sequence that includes well drained Hickory and Cincinnati soils, the moderately

some nonfarm uses. Capability unit IIIw-2; woodland suitability group 2w2.

AxA—Avonburg-Urban land complex, nearly level. This complex consists of areas where grading and digging have destroyed the original soil. Most areas are used for urban and industrial development, mainly in the villages

2 percent pebbles; medium acid; abrupt, smooth boundary.

B21t—5 to 13 inches, dark yellowish-brown (10YR 4/4) silty clay loam; weak, medium, subangular blocky structure; firm; common roots; 8 percent tubular pores; thin, patchy, yellowish-brown (10YR 5/4) clay films on vertical and horizontal ped faces; 8 percent

permeability, shallowness to bedrock, the high shrink-swell potential, and the likelihood of slumping are limitations for most nonfarm uses. Capability unit IVe–3; woodland suitability group 3cl.

BeD2—Beasley silt loam, 12 to 18 percent slopes, moderately eroded. This strongly sloping soil is mainly in

brown (10YR 3/2) organic stains on ped faces; 20 percent sandstone fragments; medium acid; abrupt, wavy boundary.

A2—2 to 6 inches, yellowish-brown (10YR 5/6) channery silt loam; weak, fine and medium, subangular blocky structure; friable to very friable; many roots; very dark grayish-brown (10YR 3/2) organic stains in old root channels; 20 percent sandstone fragments; strongly acid; clear, wavy boundary.

B21—6 to 12 inches, yellowish-brown (10YR 5/4) channery silt loam; weak, fine and medium, subangular blocky structure; friable; common roots; thin, patchy, light yellowish-brown (10YR 6/4) silt coatings on vertical and horizontal ped faces; 45 percent sandstone frag-

uses, such as hiking, horseback riding, and hunting. Capability unit VIe–3; woodland suitability group 4f1.

BgG—Berks-Muskingum channery silt loams, 35 to 50 percent slopes. This very steep complex is on dissected hillsides on the unglaciated Allegheny Plateau. It is mainly on west- and south-facing slopes, but it does occupy some north- and east-facing slopes. Areas of this complex are irregularly shaped and cover 5 to 40 acres. One area of this complex near High Knob just north of the Adams County line is larger than 200 acres, but most areas are 15 to 40 acres. Slopes are medium to long and

tain. Areas of this complex are relatively uniform in shape; they are long and are 150 to 1300 feet wide. The areas are generally large, covering as much as 200 acres, but a few areas are only 10 to 30 acres.

About 55 percent of the acreage is Berks soils, 20 percent is Muskingum soils, and 15 percent is Neotoma soils. The dark-colored Neotoma soils are always in or on the north- to east-facing slopes. One of the Neotoma soils in this complex has the profile described as representative

A representative profile in a cultivated area, the surface layer is dark-gray silt loam 9 inches thick. The subsoil extends to a depth of 51 inches. The upper 12 inches is dark-gray silty clay loam that has dark yellowish-brown, light brownish-gray, and yellowish-brown mottles. The next 14 inches is gray silty clay loam that has yellowish-brown and light brownish-gray mottles. The next 9 inches is pale-brown silty clay loam that has strong-brown mottles. The lower 7 inches is gray silty clay loam that

IIC1—51 to 70 inches, strong-brown (7.5YR 5/6) clay loam; few, fine, distinct, gray (10YR 5/1) mottles; massive; friable; 5 percent pebbles; neutral; gradual, wavy boundary.

IIC2—70 to 84 inches, yellowish-brown (10YR 5/6) heavy

58 inches. It is yellowish-brown sandy clay loam. Below that is limestone bedrock.

The available water capacity is medium in Boston soils. Permeability is moderately slow, and surface runoff

horizon and from medium acid to mildly alkaline in the B3 and Bratton series. These soils [illegible]

Erosion is the main hazard to farming these soils. Slope and underlying bedrock are limitations for most nonfarm uses. Capability unit VIe–2; woodland suitability group 2r1.

BmE2—Boston-Bratton complex, 18 to 25 percent slopes, moderately eroded. This steep complex is on side slopes along small drainageways. Most areas are wooded and range from 2 to 20 acres. About 50 percent of the complex is Boston soils, and 35 percent is Bratton soils. The steeper soils commonly have a thin, dark-colored surface layer. Bedrock outcrops are common.

BoB—Boston-Urban land complex, gently sloping. This complex consists of areas where grading and digging have destroyed or covered the original soil. Most areas have fill or borrow material and are used mainly for urban and industrial development. There are areas of undisturbed Boston soils in undeveloped lots, undisturbed parts of industrial areas, cemeteries, playgrounds, back parts of developed lots, and small wooded areas.

The fill areas are adjacent to areas of undisturbed Boston soils. The fill material is about 1 to 3 feet of clay loam till and clay residual material.

In a representative profile in a cultivated area, the plow layer is dark grayish-brown silt loam 10 inches thick. The subsoil extends to a depth of 38 inches. The upper 6 inches is brown and dark grayish-brown silt loam. The next 9 inches is reddish-brown clay. The next 8 inches is dark reddish-brown clay. The lower 5 inches is dark-brown clay. The substratum is light yellowish-brown sandy loam 2 inches thick. Limestone bedrock is at a depth of 40 inches.

The available water capacity is medium in Bratton soils. Permeability is moderately slow, and surface runoff is medium to high. The root zone is moderately deep and is neutral to strongly acid.

brown or dark brown (7.5YR 4/4), dark yellowish brown (10YR 4/3), or yellowish brown (10YR 5/4) and is 4 to 8 inches thick. The B2t horizon has a hue of 5YR, 7.5YR, or 2.5YR, value of 3 to 5, and chroma of 4 to 6. The B3 horizon is dominantly brown or dark brown (7.5YR 4/4) to dark reddish brown (5YR 3/4). Silt coatings of pale brown (10YR 6/3), brown (7.5YR 4/4), or light gray (10YR 7/2) are on ped surfaces in the B1 and upper B2t horizons, The clay films in the B2t and B3t horizons are patchy or continuous, have a hue of 10YR, 7.5YR, or 5YR, value of 3 to 5 and chroma of 3 to 6.

In some profiles there is a C horizon that has a hue of 10YR or 7.5YR, value of 5 or 6, and chroma of 3 or 4.

Bratton soils, unlike Beasley soils, have hard limestone bedrock within a depth of 40 inches. Bratton soils formed in loess over clayey residuum of limestone bedrock, but Trappist

Included with this soil in mapping are moderately well-drained Nicholson soils. Also included are many spots of a severely eroded soil. This soil has a surface layer composed entirely of silty clay or clay loam subsoil material, and shallow gullies and limestone outcrops and rock fragments are common. The soil tends to become hard and cloddy if it is cultivated when too wet. Some slightly eroded areas and sinkholes are also included.

The main limitations for farming are the moderate erosion that has already occurred and the hazard of further erosion if the soil is used for crops. Loss of the surface layer has resulted in a thinner root zone and a lower available water capacity. Because of the many sinkholes and the shallowness to underlying fractured bedrock, this soil is poorly suited for farm ponds and many other nonfarm uses. Capability unit IIe–1; woodland suitability group 2c1.

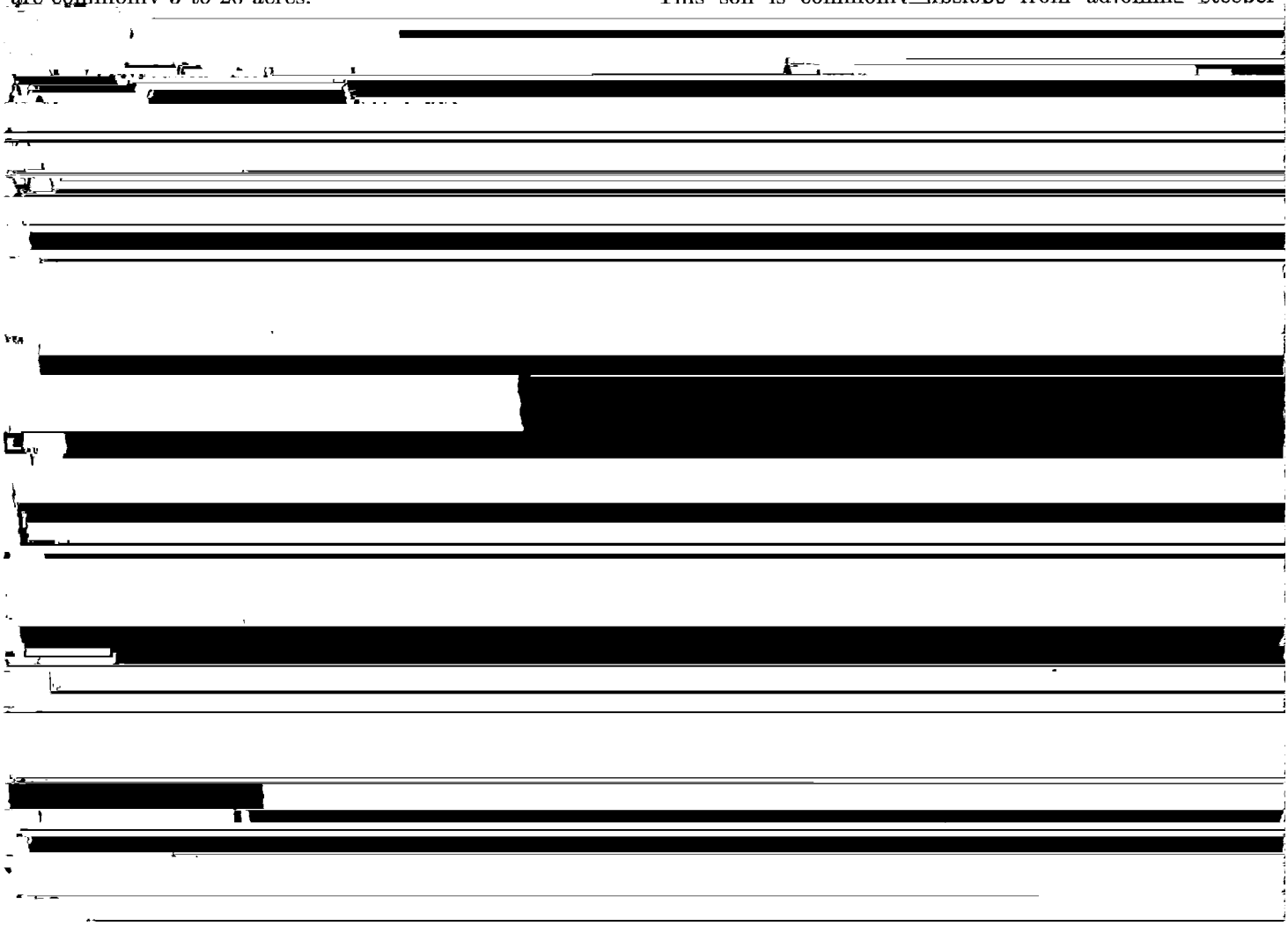
BpC2—Bratton silt loam, 6 to 12 percent slopes, moderately eroded. This soil is commonly on side slopes along streams and drainageways and on broad, irregularly shaped, low ridges in the uplands. The downhill slopes are generally short, but areas of the soil run laterally along the streams or minor drainageways for several hundred feet. This soil also is commonly upslope from adjoining steeper Opequon soils. Areas range from 1 to 95 acres but are commonly 5 to 20 acres.

is redder, and is somewhat finer textured. Seep areas or wet-season springs are common at the base of the slopes.

Included with this soil in mapping are shallow Opequon soils and shallow, dark-colored Gasconade soils. The Opequon soils are in depressions, at the base of slopes, or in narrow bands along drainageways. Also included are many severely eroded areas that have bedrock outcrops, shallow gullies, and fragments of limestone, chert, and geodes on the surface. These areas have a surface layer of silty clay loam to clay. Many cracks, ⅛ to ½ inch wide, develop during dry seasons in the severely eroded areas. Many slightly eroded areas where the soil has been in woodland or permanent pasture are also included.

This soil is suited to limited farming, but it is better suited to permanent pasture or woodland because of the slope and erosion. Shallowness to bedrock, slow permeability, high shrink-swell potential, and slope are limitations for homesites and many other nonfarm uses. Capability unit IVe–3; woodland suitability group 2c2.

BrD3—Bratton silty clay loam, 12 to 18 percent slopes, severely eroded. This soil is commonly on side slopes along streams and drainageways and on broad, irregularly shaped, low ridges in the uplands. Downhill slopes are generally short, but areas of the soil run laterally along the streams or minor drainageways for several hundred feet. This soil is commonly upslope from adjoining steeper



inches is dark-gray to grayish-brown clay mottled with yellowish brown. The lower 27 inches is gray and yellowish

value of 4 to 6, and chroma of 4 through 6. The IIB1t and IIB2t horizons range from clay loam to clay, the IIB3

wet, the surface layer is likely to be cloddy. Wetness, moderately slow permeability, a seasonal high water table, surface ponding, and a high shrink-swell potential are limitations for homesites, septic tank absorption fields, and other nonfarm uses. Capability unit IIw–4; woodland suitability group 2w1.

Cana Series

The Cana series consists of moderately well drained to well drained, gently sloping to very steep soils on uplands. These soils formed mainly in loess and the underlying Illionoian glacial till over shale bedrock. The native vegetation was hardwood forest in which oak, beech, maple, and yellow-poplar were dominant.

In a representative profile, the plow layer is dark grayish-brown silt loam 9 inches thick. The subsurface layer is brown and dark grayish-brown heavy silt loam 4 inches thick. The subsoil extends to a depth of 43 inches. The upper 5 inches is brown silty clay loam. The next 10 inches is brown clay loam. The next 8 inches is strong-brown clay loam that has light brownish-gray mottles. The lower 7 inches is brown silty clay that has light-gray and yellowish-red mottles. The substratum is light brownish-gray, strong-brown, and reddish-brown clay that extends to a depth of 55 inches. Shale bedrock is below that.

The available water capacity is medium in Cana soils. Permeability is slow, and surface runoff is medium to rapid. The root zone is moderately deep and is neutral to very strongly acid.

prominent, black (10YR 2/1) stains and concretions; 10 percent pebbles; strongly acid; clear, wavy boundary.

IIB23t—28 to 36 inches, strong-brown (7.5YR 5/6) clay loam; common, fine, prominent, light brownish-gray (2.5YR 6/2) mottles; strong, fine and medium, subangular blocky structure; firm; few roots; thin, patchy, reddish-brown (5YR 4/4) and yellowish-brown (10YR 5/4) clay films on vertical and horizontal ped faces; common, fine, prominent, black (10YR 2/1) stains and concretions; 10 percent pebbles; very strongly acid; clear, smooth boundary.

IIIB3t—36 to 43 inches, brown (7.5YR 4/4) silty clay; common, medium, prominent, light-gray (10YR 7/1) mottles and common, fine, prominent, yellowish-red (5YR 4/6) mottles; weak, medium, subangular blocky structure; firm; common, fine, prominent, black (10YR 2/1) stains and concretions; 20 percent pebbles; very strongly acid; gradual, smooth boundary.

IIIC—43 to 55 inches, light brownish-gray (10YR 6/2), strong-brown (7.5YR 5/6), and reddish-brown (5YR 4/4) clay; moderate, medium, platy structure; very firm; shale fragments of gray (10YR 6/1), dark gray (10YR 4/1), and very dark grayish brown (10YR 3/2); extremely acid.

IIIR—55 inches, shale bedrock.

The solum is 30 to 60 inches thick. The loess cap ranges from 0 to 18 inches in thickness, but is typically 6 to 14 inches thick. Reaction in the Ap horizon through the IIB2t horizon is neutral to very strongly acid, and in the B3 horizon and C horizon is strongly acid to extremely acid.

The Ap horizon is dark grayish brown (10YR 4/2), brown (10YR 5/3), or dark brown (10YR 4/3). In wooded areas and other undisturbed areas, there is an A1 horizon that is very dark grayish brown (10YR 3/2) or very dark brown (10YR 2/2) and is 1 to 4 inches thick. There is also a brown (7.5YR 5/4 and 4/4) or yellowish-brown (10YR 5/4) A2 horizon 2 to 6 inches thick.

The B1t and B2t horizons are 10 to 36 inches thick. They

on the Allegheny Plateau and on side slopes in the glaciated part of the county. The side slopes may be convex or concave. Areas range from 2 to 40 acres, but most are 3 to 15 acres. This soil has a profile similar to the one described as representative of the series, but the plow layer is partly material from the upper part of the subsoil, is browner, and contains less loess.

Included with this soil in mapping are areas that are slightly eroded and small areas of Miamian and Rossmoyne soils in the Wisconsin and Illinoian glaciated areas. Scattered small, severely eroded spots are also included.

The hazard of erosion is severe if this soil is used for crops. Slow permeability and shallowness to shale bedrock are limitations for most nonfarm uses. Capability unit IIIe–5; woodland suitability group 3o1.

CaD2—Cana silt loam, 12 to 18 percent slopes, moderately eroded. This soil is in cleared and wooded areas on dissected, glaciated toe slopes on the Allegheny Plateau. Areas of this soil are broad and rounded to irregularly shaped, but most are elongated and are on ridgetops between other steeply dissected Cana soils. They range

Below that, to a depth of 20 inches, it is firm, dark-brown gravelly clay loam that grades to gravelly sandy clay loam in the lower part. The substratum is friable, yellowish-brown, gravelly sandy loam that grades to loose, yellowish-brown sand and gravel below a depth of 40 inches.

The available water capacity is low in Casco soils. Permeability is moderate to moderately rapid in the surface layer and subsoil and is moderately rapid to rapid in the gravelly substratum. The root zone is shallow and is commonly neutral to medium acid.

Casco soils are used mainly for hay and pasture. A large acreage of the steeper Casco soils is in forest. A small part of the cleared acreage is idle and is reverting to forest.

Representative profile of Casco gravelly loam, 18 to 35 percent slopes, moderately eroded, in a cultivated field 1¾ miles south-southeast of Centerfield, 75 yards east of Cope Road, and 75 yards south of barn, in Paint Township:

Ap—0 to 4 inches, dark grayish-brown (10YR 4/2) gravelly loam; moderate fine and medium granular structure;

higher base saturation than Negley soils, and they are not so deeply leached. Casco soils formed in loamy outwash material over calcareous sand and gravel, but Kendallville soils lack the calcareous sand and gravel substratum.

CcD3—Casco gravelly loam, 12 to 18 percent slopes, severely eroded. This moderately steep soil is on terraces

The substratum is yellowish-brown loam that has light brownish-gray and yellowish-brown mottles and extends to a depth of 60 inches.

The available water capacity is medium in Celina soils. Permeability is moderately slow, and surface

The Ap horizon is dark grayish brown (10YR 4/2), grayish brown (10YR 5/2), or brown (10YR 4/3). Profiles in undisturbed areas have an A1 horizon, 1 to 4 inches thick, that is very dark grayish brown (10YR 3/2) or black (10YR 2/1).

The B1 horizon is mainly yellowish brown (10YR 5/4 and 5/6). The B2 horizon has a hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 4. The B1 and B2t horizons are silty clay loam, silty clay, and clay. Clay films on ped faces in the B2t horizon are dark grayish brown (10YR 4/2), brown (10YR 4/3), or dark yellowish brown (10YR 3/4). Mottles have a hue of 10YR, value of 5 or 6, and chroma of 2 through 8.

The C horizon is yellowish brown (10YR 5/4) or brown (10YR 5/3).

Celina soils are part of the drainage sequence that includes well-drained Hennepin and Miamian soils, somewhat poorly drained Crosby soils, and very poorly drained Brookston soils. Celina soils have a thinner loess cap and are shallower to calcareous till than Xenia soils. They have a higher clay content in the B2t horizon than the Xenia soils. Celina soils are underlain by glacial till, and Markland soils are underlain by lacustrine material. They lack the calcareous shale residuum and bedrock underlying the Loudon soils.

CeB—Celina silt loam, 2 to 6 percent slopes. This gently sloping soil is in broad areas that lie between Miamian and Crosby soils, in areas along minor drainageways, and on some long, narrow ridgetops in the somewhat dissected uplands. Most slopes are slightly concave but some are slightly convex, and they vary in length and width. Areas generally range from 3 to 30 acres, but some are as large as 50 acres.

This soil has the profile described as representative of the series. In most places only a little of the original surface layer has been removed through erosion. In a few

CgA—Celina-Xenia silt loams, 0 to 2 percent slopes. These nearly level soils are in broad, slightly concave, transitional areas between the gently sloping Miamian-Russell complex and either the nearly level Crosby-Fincastle complex or Brookston soils. Some small areas are at the head of small, crossable waterways. Areas commonly range from 3 to 15 acres. About 50 percent of this complex is Celina soils, and 40 percent is Xenia soils.

These soils have a thicker surface layer than the profiles described as representative of the Celina and Xenia series, because they receive inwash from surrounding soils.

Included with these soils in mapping are Crosby-Fincastle silt loams and Brookston silt loam along small waterways and in small, slight depressions.

These soils have few limitations for farming. The included soils are wet and may need to be drained. The moderately slow permeability and a seasonal high water table are limitations for many nonfarm uses. Capability unit I–1; woodland suitability group 2o1.

CgB—Celina-Xenia silt loams, 2 to 6 percent slopes. These gently sloping soils are in broad areas along minor drainageways where slopes are long to short and on some long, narrow ridgetops in the somewhat dissected uplands. Most slopes are slightly concave, but many are slightly convex and vary in length and width. Areas generally range from 3 to 30 acres. About 55 percent of this complex is Celina soils, and 35 percent is Xenia soil. The Xenia soil in this complex has the profile described as representative of the Xenia series.

Cincinnati soils are used mainly for corn, wheat, soybeans, and grass-legume mixtures for hay and pasture. A moderate acreage is used for permanent pasture and woodland, and a small acreage is idle.

Representative profile of Cincinnati silt loam, 2 to 6 percent slopes, 4½ miles south-southwest of Hillsboro, 0.7 mile south of the intersection of Griffith and Swisshelm Roads, ¼ mile north of Warlamount Road, and 125 yards east of Swisshelm Road in New Market Township:

Ap—0 to 10 inches, brown (10YR 4/3) silt loam; moderate, fine and medium granular structure; friable; many

The solum ranges from 48 to 120 inches in thickness but is typically 80 to 100 inches thick. The loess cap is 18 to 40 inches thick. The depth to the fragipan ranges from 18 to 38 inches in uneroded areas. The fragipan is typically light clay loam but includes light silty clay loam or loam.

Reaction is very strongly acid or strongly acid in the B horizon above a depth of 40 inches and through the fragipan in places. The B3 horizon and the fragipan can range from strongly acid to slightly acid.

The Ap horizon is dark grayish brown (10YR 4/2), or brown (10Y 5/3 and 4/3). The B2t horizon is silty clay loam, clay loam, heavy silt loam, or heavy loam. The B2t horizon and the fragipan are yellowish brown, dark yellowish brown,

[redacted]

clay films on vertical, irregular, rounded ped faces; common, medium, distinct, black (10YR 2/1) stains; 5 percent gray (10YR 6/1) krotovinas; 4 percent pebbles; very strongly acid; clear, wavy boundary.

IIB31—62 to 78 inches, yellowish-brown (10YR 5/6) and dark yellowish-brown (10YR 4/4) clay; common, medium, subangular blocky structure; firm; many, coarse,

In a respresentative profile in a wooded area, the surface layer is dark-gray silt loam 2 inches thick. The subsurface layer is yellowish-brown silt loam 3 inches thick. The subsoil extends to a depth of 15 inches. The upper 4 inches is yellowish-brown silty clay loam that has light

The B horizon is commonly yellowish brown (10YR 5/4 and 5/6) and brown (7.5YR 5/4), but in some places it is reddish brown (5YR 4/4). The B horizon includes silt loam and silty clay loam and is shaly in places. The content of shale fragments in the B horizon ranges from 20 to 50 percent.

The color of the C horizon is similar to that of the B horizon. The content of shale fragments in the C horizon ranges from 50 to 80 percent.

The Colyer soils in Highland County contain less clay in the earth fraction of the profile than is defined in the range for the Colyer series. This difference, however, does not alter their usefulness or behavior.

Colyer soils are part of the drainage sequence that includes well-drained Trappist and Muse soils. Colyer soils have a thinner, coarser textured solum and are shallower to bedrock than Trappist and Muse soils. Colyer soils formed over acid shale bedrock, but Gasconade and Opequon soils formed over limestone bedrock.

The Colyer soil in this complex has the profile described as representative of the Colyer series. The content of shale fragments in the surface layer of these soils ranges from 0 to 35 percent and varies considerably within short horizontal distances.

Included with these soils in mapping are small areas that are moderately or severely eroded and that have small gullies, a finer textured surface layer, and rock outcrops. Larger areas of Tuscarawas channery silt loam are included on the upper part of slopes next to steeper Berks-Muskingum-Neotoma channery silt loams. Many seep areas and springs are included on the steep slopes.

Most of the acreage of this complex is woodland. The shallowness to bedrock and steep slopes are severe

Crosby soils are used mainly for corn, soybeans, wheat, and grass-legume mixtures for hay and pasture. A small acreage is in permanent pasture or woodland.

thinner loess cap than Fincastle soils. They are underlain by glacial till, and McGary soils are underlain by lacustrine material. Crosby soils have a finer textured solum and lack

uses. Capability unit IIw–2; woodland suitability group 3w1.

CuA—Crosby-Urban land complex, nearly level. This complex consists of nearly level areas where grading and digging have destroyed or covered much of the original soil. Most of these areas are used for urban and industrial development in and near Greenfield. About 40 to 50 percent of the acreage is disturbed soils. There are undisturbed Crosby soils in undeveloped lots, in the back part of developed lots, and in the unused part of mobile home parks.

Fill areas have about 1 to 3 feet of fill material overlying undisturbed Crosby soils. The fill material consists of clay loam and clay subsoil material and loam substratum material from borrow areas of Celina and other nearby soils.

Included with this complex in mapping are Brookston

very dark grayish-brown (10YR 3/2) and dark grayish-brown (10YR 4/2) organic stains in old root channels, in pores, and on some ped faces; 2 percent pebbles; medium acid; clear, wavy boundary.

B21t—20 to 28 inches, dark yellowish-brown (10YR 4/4) silty clay loam; moderate, medium, subangular blocky structure; firm; few roots; thin, patchy, dark-brown (10YR 4/3) clay films on vertical and horizontal ped faces; 5 percent pebbles; strongly acid; gradual, wavy boundary.

IIB22t—28 to 40 inches, yellowish-brown (10YR 5/4) silty clay loam; common, medium, distinct, grayish-brown (10YR 5/2) and yellowish-brown (10YR 5/8) mottles; moderate to strong, medium, subangular blocky structure; firm; thin, patchy, dark-brown (7.5YR 4/4) clay films on horizontal ped faces and medium, continuous, dark-brown (7.5YR 4/4) clay films on vertical ped faces; common, medium, distinct, very dark grayish-brown (10YR 3/2) stains and concretions; 10 percent pebbles; strongly acid; gradual, wavy boundary.

This soil has few limitations for farming. Seasonal wetness is a limitation for many nonfarm uses. Capability unit I–1; woodland suitability group 2o1.

Dubois soils are used mainly for corn, wheat, soybeans, and grass-legume mixtures for hay and pasture. A small acreage is idle.

coarse, subangular blocky structure; firm; common, medium, prominent, black (10YR 2/1) stains; 5 percent pebbles; moderately alkaline; clear, wavy boundary.

IIB33—87 to 103 inches, strong-brown (7.5YR 5/6) gravelly clay loam; common, medium, distinct, gray (10YR 6/1) mottles; weak, coarse, subangular blocky structure; firm; 20 percent gravel; moderately alkaline; clear, wavy boundary.

IIC—103 to 125 inches, yellowish-brown (10YR 5/6) gravelly clay loam; common, coarse, distinct, grayish-brown (10YR 5/2) mottles; massive, firm; 20 percent gravel; moderately alkaline; abrupt, wavy boundary.

IIIC—125 to 131 inches, strong-brown (7.5YR 5/6) gravelly loam; massive; friable; 20 percent pebbles; brownish-yellow (10YR 6/6) weathered remnants of limestone; moderately alkaline, calcareous.

The solum is 80 to 120 inches thick. The loess cap is about 20 to 40 inches thick. The depth to stratified material ranges from about 35 to 50 inches. Reaction is very strongly [illegible] medium acid below the A[illegible] horizon through the B[illegible]

not grow well on this soil. The very slow permeability in the fragipan and seasonal wetness are limitations for many nonfarm uses. Capability unit IIIw–2; woodland suitability group 2w2.

Edenton Series

The Edenton series consists of well-drained, sloping to very steep soils. These soils formed in loess and the underlying Illinoian glacial till over residuum weathered from limestone and shale bedrock. They are on dissected Illinoian glacial till uplands. The native vegetation was deciduous and coniferous forest of beech, maple, oak, ash, and redcedar.

In a representative profile, the surface layer is brown silt loam 4 inches thick. The subsoil extends to a depth of 32 inches. The upper 16 inches is yellowish-brown clay

mildly alkaline, calcareous; abrupt, irregular boundary.

IIC2—38 inches, interbedded calcareous shale and limestone.

The solum is 20 to 40 inches thick and the depth to shale and

for most nonfarm uses. Capability unit IVe–3; woodland suitability group 3r1.

EbF2—Edenton silt loam, 18 to 35 percent slopes, moderately eroded. This steep to very steep soil is on

4/1) and light brownish-gray (10YR 6/2) mottles; weak, medium, subangular blocky structure; friable; few roots; few, medium, distinct, very dark brown (10YR 2/2) stains; few pebbles; mildly alkaline; clear, wavy boundary.

B23—23 to 29 inches, dark grayish-brown (10YR 4/2) silt loam; few, medium, faint, dark-gray (10YR 4/1) and pale-brown (10YR 6/3) mottles; weak, medium, subangular blocky structure; friable; few roots; few pebbles; mildly alkaline; gradual, wavy boundary.

B24—29 to 40 inches, dark grayish-brown (10YR 4/2) loam; common, medium, distinct, brown (10YR 5/3) and yellowish-red (5YR 4/6) mottles; massive; very fri-

are on till plains. The native vegetation was hardwood forest, in which ash, maple, and elm were dominant.

In a representative profile in a cultivated area, the surface layer is dark grayish-brown silt loam 7 inches thick. The subsurface layer, to a depth of 11 inches, is yellowish-brown and pale-brown silt loam that has gray mottles. The subsoil extends to a depth of 47 inches. The upper 7 inches is dark yellowish-brown silty clay loam that has gray, grayish-brown, and yellowish-brown mottles. The next 8 inches is dark yellowish-brown silty clay loam that has yellowish-brown and grayish-brown mottles.

[redacted]

stains and concretions; 15 percent pebbles; neutral; clear, wavy boundary.

IIIC1—68 to 77 inches, strong-brown (7.5YR 5/6) and gray (10YR 6/1) gravelly clay loam; common, fine, distinct, dark yellowish-brown (10YR 4/4) mottles; massive; firm; few, medium, prominent, black (10YR 2/1) stains; 25 percent gravel; neutral; clear, wavy boundary.

IIIC2—77 to 90 inches, brown (10YR 5/3) gravelly loam; common, medium, distinct, gray (10YR 5/1) and yellowish-brown (10YR 5/8) mottles; massive; fri-

are damaged most during periods of excessive wetness Wetness is also a limitation for nonfarm uses. Capability unit IIw–2, woodland suitability group 2w2.

FcB—Fitchville silt loam, 2 to 6 percent slopes. This gently sloping soil is in narrow to moderately broad, somewhat irregularly shaped areas of 3 to 20 acres. It is between better drained Sardinia or Williamsburg soils and dark-colored Westland soils. A large acreage on

IIB1—13 to 18 inches, yellowish-brown (10YR 5/4) and dark-brown (10YR 4/3) silt loam; weak, fine and medium, subangular blocky structure; friable; common roots; 5 percent pebbles; medium acid; clear, wavy boundary.
IIB21t—18 to 27 inches, yellowish-brown (10YR 5/4) clay loam; moderate, fine and medium, subangular blocky structure; firm; few roots; thin, patchy, brown (7.5YR

loam. Spots of Ockley and Kendallville soils that have a surface layer of silt loam and are mostly in the uplands are also included.

Slope, droughtiness, and erosion are limitations for crops and irrigation and for nonfarm uses. Capability unit IIIe–4; woodland suitability group 2o1.

FoC3—Fox clay loam, 6 to 12 percent slopes, severely eroded. This sloping soil is on the short terraces in narrow bands along streams and in the uplands. Areas cover 5 to 15 acres. There are many small, shallow gullies and some larger gullies that cannot be crossed by farm equipment. Nearly all of the original surface layer has [illegible]

The B horizon is typically flaggy and channery silty clay or flaggy and channery clay, but in some places it contains silty clay loam. It ranges from 4 to 12 inches in thickness but is commonly 4 to 10 inches thick. The B horizon is typically dark yellowish brown (10YR 4/4) or dark brown (10YR 4/3), but it is dark grayish brown (10YR 4/2) in some places.

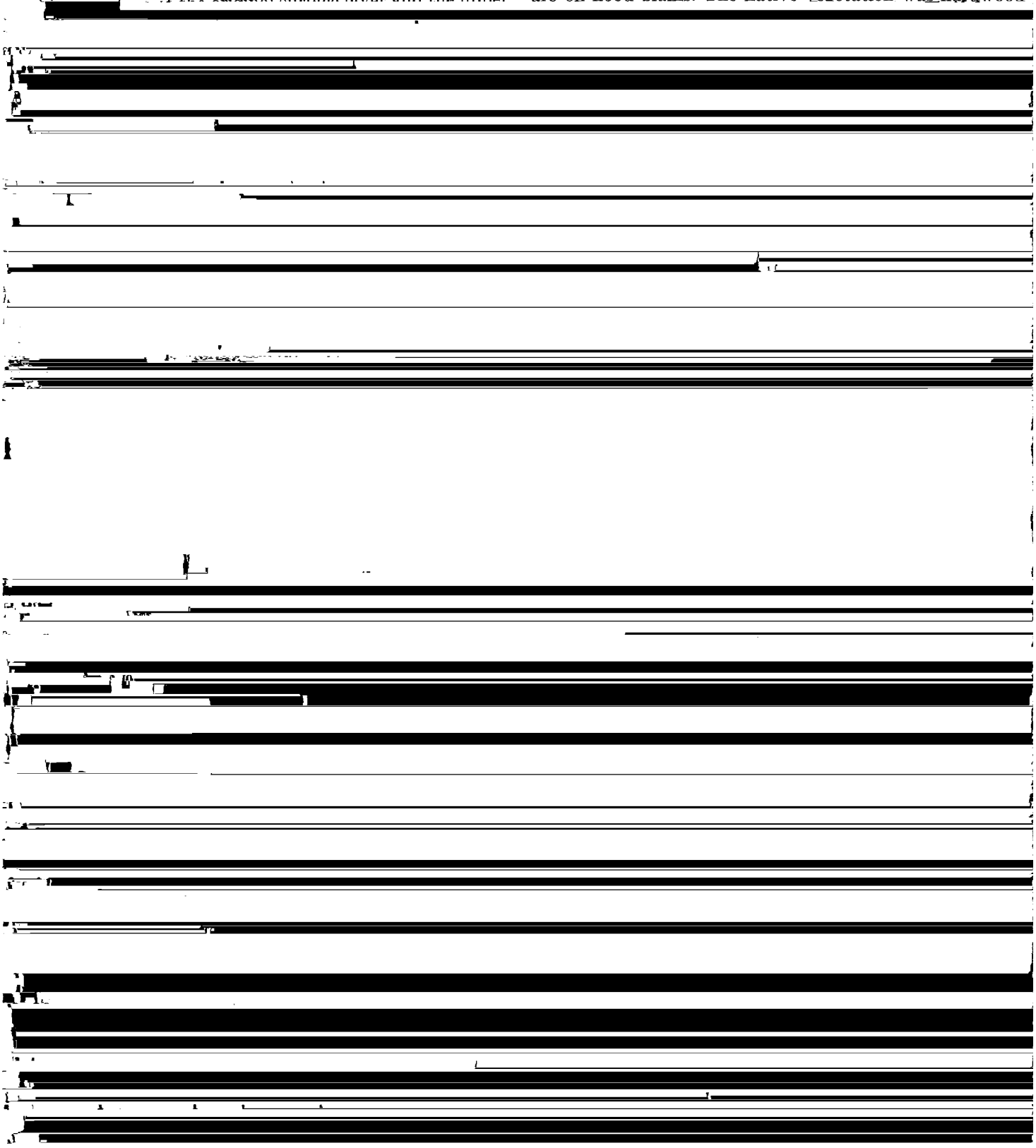
The thin C horizon is partly weathered limestone material [illegible]

They cover 2 to 20 acres. Slopes are convex and are 85 to 200 feet long.

This soil has a profile similar to the one described as representative of the series, but its surface layer is thinner [redacted] of the original surface layer and the upper

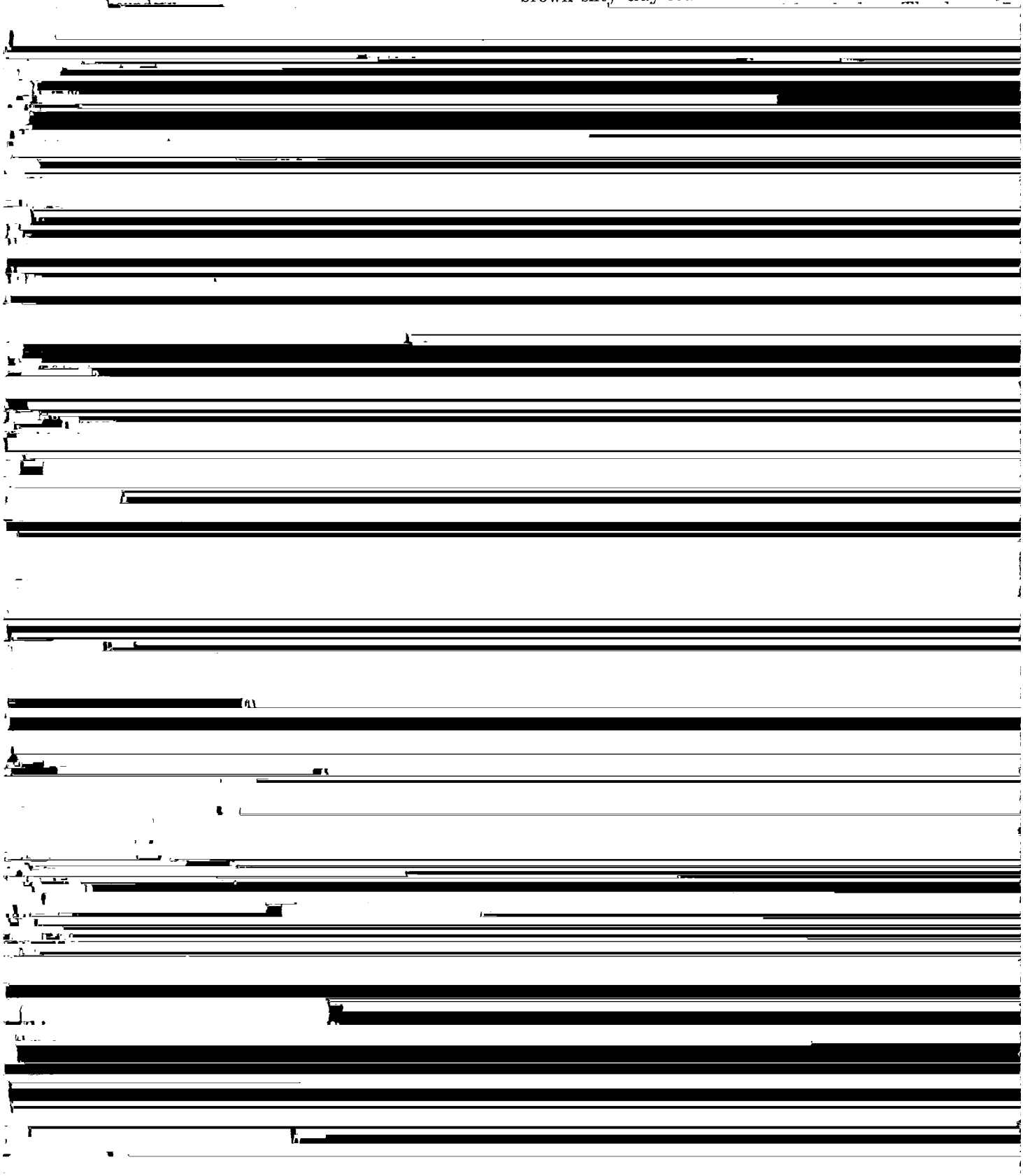
Genesee Series

The Genesee series consists of well-drained, nearly level soils that formed in alluvial material. The Genesee soils are on flood plains. The native vegetation was hardwood



B1—7 to 12 inches, dark-brown (10YR 4/3) silt loam; moderate, thick, platy structure; friable; few roots; common vesicular pores; mildly alkaline; clear, smooth

extends to a depth of 56 inches. The upper 5 inches is yellowish-brown silt loam. The next 14 inches is yellowish-brown silty clay loam. The next 8 inches is brown clay.



black (10YR 2/1) concretions and stains; 5 percent of the more eroded and steeper Guernsey soils is idle and

Included with this soil in mapping are a few areas of dark-colored Lawshe soils at the head of drainageways and in narrow bands along drainageways and a few small areas of Beasley soils. Also included are a few spots that are moderately eroded. The surface layer in these spots is a mixture of the original surface layer and subsoil material and is somewhat browner and finer textured.

The hazard of erosion is the major limitation for crops. Moderately slow to slow permeability is a limitation for

Included with this soil in mapping are small areas of dark-colored Lawshe and Beasley soils.

The hazard of erosion is severe, and this soil is best suited to permanent pasture or woodland. The severe erosion, slumping, slope, and shallowness to bedrock are limitations for nonfarm uses. Capability unit VIe–2; woodland suitability group 2w3.

IIBx2—28 to 37 inches, yellowish-brown (10YR 5/4) loam; common, fine and medium, gray (10YR 5/1) mottles; weak, very coarse, prismatic structure parting to weak, coarse, subangular blocky; very firm and brittle; few fine roots in vertical cracks; medium, continuous, dark-brown (7.5YR 4/4) and brown (10YR 5/3) clay films on ped faces; thin, patchy, light-gray (10YR 7/2) silt coatings on vertical and

Because this soil is nearly level and has a silt loam surface layer that is easily tilled, it is well suited to tobacco. Wetness is a moderate hazard. Slow permeability is a limitation for some nonfarm uses. Capability unit IIw–3; woodland suitability group 2o1.

HbB—Haubstadt silt loam, 2 to 6 percent slopes. This gently sloping soil is in broad areas between waterways and

The hazard of erosion is severe. Slope and slow permeability in the fragipan are severe limitations to some nonfarm uses. Capability unit IVe-2; woodland suitability group 2o1.

HbD2—Haubstadt silt loam, 12 to 18 percent slopes, moderately eroded. This moderately steep soil is along streams and on benches along valley sides. Areas cover

moisture content. The surface layer tends to become hard when dry.

There is a hazard of erosion, particularly in construction areas that are without plant cover. If the soil is dry, the fragipan in the undisturbed areas of Haubstadt soils is somewhat difficult to excavate. Capability unit and woodland suitability group not assigned.

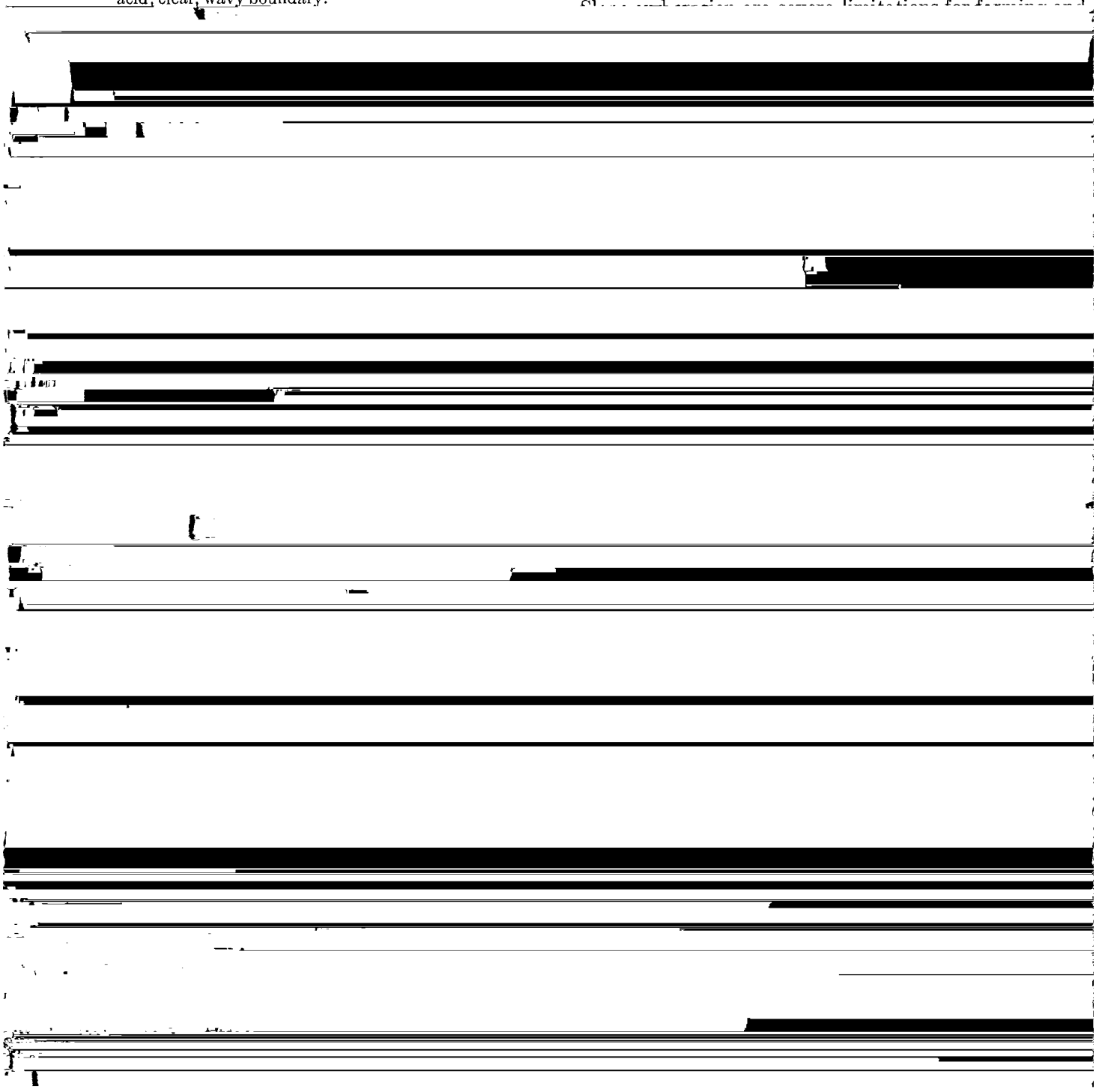
Route 138, and 50 feet north of State Route 138, in Paint Township:

A1—0 to 4 inches, dark grayish-brown (10YR 4/2) silt loam; weak, fine and medium, granular structure; very friable; many roots; common tubular pores; 15 percent pebbles; neutral; abrupt, wavy boundary.

A2—4 to 7 inches, yellowish-brown (10YR 5/4) silt loam; weak, fine and medium, subangular blocky structure; friable; common roots; common tubular and vesicular pores; many, medium, faint, dark grayish-brown (10YR 4/2) organic stains; 15 percent pebbles; slightly acid; clear, wavy boundary.

Areas range from 5 to 30 acres. This complex is about 80 percent Hennepin soils and 20 percent Miamian and other soils.

Included with this complex in mapping are slightly eroded Hennepin and Miamian soils and other soils in wooded areas. Also included are severely eroded areas of these soils where the surface layer has a texture more like that of the subsoil or substratum. Small areas of soils that are shallow to limestone bedrock are included in places on the lower part of the slopes.



A large acreage of steeper and more eroded Hickory soils is used for pasture and woodland. A small acreage is idle (fig. 5).

Representative profile of Hickory silt loam, 6 to 12 percent slopes, moderately eroded, in a cultivated field 1½ miles northwest of Buford, ½ mile east of the Brown County line, ½ mile south of the intersection of State Route 286 and Beltz Road, and 350 feet east of Beltz Road, in Clay Township:

Ap—0 to 6 inches, dark grayish-brown (10YR 4/2) silt loam; many, medium and coarse, distinct, yellowish-brown (10YR 5/6) mottles; weak, fine and medium, granular structure; friable; many roots; neutral; abrupt, smooth boundary.

distinct, black (10YR 2/1) stains and concretions; 5 percent pebbles; medium acid; clear, wavy boundary.

IIB3—32 to 36 inches, dark yellowish-brown (10YR 4/4) clay loam; common, medium, distinct, yellowish-brown (10YR 5/8) mottles; massive in places parting to weak, coarse, subangular blocky structure; firm, few roots; dark grayish-brown (10YR 4/2) clay films along root and worm channels; few, fine, distinct, black (10YR 2/1) stains and concretions; 8 percent pebbles; neutral; clear, wavy boundary.

IIC—36 to 60 inches, brown (10YR 5/3) clay loam; common, medium, distinct, yellowish-brown (10YR 5/8) and gray (10YR 6/1) mottles; massive; very firm; 10 percent pebbles; mildly alkaline, calcareous.

The thickness of the solum and the depth to calcareous glacial till range from 18 to 45 inches but are commonly 30 to

glacial till, and Edenton soils are underlain by limestone bedrock. Hickory soils have a more clayey B horizon and are deeper to calcareous glacial till than Hennepin soils. They lack a fragipan and are shallower to calcareous glacial till than Cincinnati soils.

HkC2—Hickory silt loam, 6 to 12 percent slopes, moderately eroded. This sloping soil is in narrow bands along streams and slope breaks. In some places it has short slopes and separates less sloping areas. Areas cover 4 to 30 acres.

This soil has the profile described as representative of some places are areas of Edenton soils that are underlain by shale and limestone bedrock. Where the lower slopes join the flood plain of streams, small areas of alluvial soils are also included.

Slope and erosion are severe limitations for farming and for nonfarm uses. Most areas are in a permanent cover of grass or trees. Capability unit VIe–1; woodland suitability group 2r1.

HyC3—Hickory clay loam, 6 to 12 percent slopes, severely eroded. This sloping soil is in narrow bands along

Slope and the severe erosion are severe limitations for farming and for nonfarm use. Capability unit VIe–1; woodland suitability group 2r1.

Jessup Series

The Jessup series consists of well-drained, moderately steep soils that formed in loess, glacial till, and residuum weathered from shale. The Jessup soils are on dissected uplands in areas of Illinoian glacial till. The native vegetation was hardwood forest in which oak, maple, and beech were dominant.

In a representative profile, the surface layer is brown silt loam 6 inches thick. The subsurface layer is light yellowish-brown silt loam 4 inches thick. The subsoil extends to a depth of 46 inches. The upper 7 inches is yellowish-brown silty clay loam. The next 7 inches is brown silty clay loam. The next 14 inches is yellowish-brown clay that has strong-brown mottles in the upper part and grayish-brown and light olive-brown mottles in the lower part. The lower 8 inches is yellowish-brown silty clay that has light brownish-gray and light olive-brown mottles. The substratum, to a depth of 60 inches, is olive and grayish-brown silty clay.

The available water capacity is medium in Jessup soils. Permeability is slow, and surface runoff is rapid. The root zone is moderately deep and is commonly medium acid to very strongly acid.

Jessup soils are used mostly for pasture, hay, and woodland. A large acreage of eroded Jessup soils is idle and is reverting to woodland.

Representative profile of Jessup silt loam, 12 to 18 percent slopes, in an uncultivated field 1¾ miles south of Hillsboro, 250 yards east of State Route 247, and 330 feet north of Rocky Fork Creek, in Liberty Township:

Ap—0 to 6 inches, brown (10YR 4/3) silt loam; weak, medium and coarse, granular structure; very friable; many roots; medium acid; abrupt, smooth boundary.

A2—6 to 10 inches, light yellowish-brown (10YR 6/4) silt loam; weak, thick, platy structure; friable; many roots; brown (10YR 4/3) and dark grayish-brown (10YR 4/2) organic stains and material in old root channels; medium acid; clear, wavy boundary.

B1—10 to 17 inches, yellowish-brown (10YR 5/4) silty clay loam; weak, medium, subangular blocky structure; friable; common roots; thin, very patchy, pale-brown (10YR 6/3) and light-gray (10YR 7/2) silt coatings on vertical ped faces; 5 percent pebbles; strongly acid; clear, wavy boundary.

IIB21t—17 to 24 inches, brown (7.5YR 5/4) silty clay loam; moderate, medium and fine, subangular blocky structure; firm; few roots; thin, patchy, dark yellowish-brown (10YR 4/4) clay films on ped faces; thin, very patchy, light yellowish-brown (10YR 6/4) and light-gray (10YR 7/2) silt coatings on vertical ped faces; 10 percent pebbles; very strongly acid; clear, wavy boundary.

IIB22t—24 to 32 inches, yellowish-brown (10YR 5/6) clay; common, medium, distinct, strong-brown (7.5YR 5/8) mottles; moderate, medium and coarse, subangular blocky structure parting to moderate, fine and very fine, angular blocky; firm; thin and medium, patchy, brown (10YR 4/3) and yellowish-brown (10YR 5/4) clay films on ped faces; 10 percent pebbles; medium acid; clear, wavy boundary.

IIIB3t—38 to 46 inches, yellowish-brown (10YR 5/4 and 5/6) silty clay; common, fine and medium, distinct, light brownish-gray (2.5Y 6/2) mottles and few, medium, distinct, light olive-brown (2.5Y 5/6) mottles; weak, coarse, prismatic structure parting to moderate, fine, angular and subangular blocky; firm; thin, very patchy, yellowish-brown (10YR 5/4) clay films on vertical ped faces; common, fine and medium, distinct, black (10YR 2/1) stains and concretions; 5 percent shale fragments; neutral; gradual, wavy boundary.

IIIC—46 to 60 inches, olive (5Y 5/4 and 5/6) and grayish-brown (2.5Y 5/2) silty clay; moderate and strong vertical structure faces and platy shale below a depth of 55 inches; very firm; gray (N 5/0) and light yellowish-brown (2.5Y 6/4) shiny pressure faces; 5 percent shale fragments in upper part and 15 percent below a depth of 55; inches; mildly alkaline, calcareous.

The solum is 30 to 60 inches thick, and the loess cap is 10 to 24 inches thick. The glacial till material is 6 to 38 inches thick. Reaction is medium acid to very strongly acid in the upper part of the B horizon and is neutral in the lower part.

The Ap horizon is dark grayish brown (10YR 4/2) to brown (10YR 5/3). Profiles in undisturbed areas have an A1 horizon, 1 to 3 inches thick, that is very dark grayish brown (10YR 3/2) or dark gray (10YR 4/1). The A2 horizon is yellowish brown (10YR 5/4), light yellowish brown (10YR 6/4), brown (10YR 5/3), or pale brown (10YR 6/3).

The B1 horizon is heavy silt loam or silty clay loam, and the B2t and B3t horizons are heavy silty clay loam, clay loam, or clay. The B1 and IIB2t horizons have a hue of 10YR or 7.5YR, value or 4 or 5, and chroma of 4 through 6.

The B3t and C horizons have a hue of 2.5Y, 5Y, and 10YR, value of 5 through 7, and chroma of 3 through 6, and mottles that have a chroma of 2 or less. The C horizon is silty clay or clay.

Jessup soils are part of the drainage sequence that includes moderately well drained Loudon soils. Jessup soils, unlike Trappist and Muse soils, are underlain by calcareous shale bedrock and formed partly in glacial till. They are deeper to bedrock than Edenton soils. They differ from Miamian soils in having C horizon of shale residual material. Jessup soils lack the fragipan of Cincinnati soils.

JeD—Jessup silt loam, 12 to 18 percent slopes. This moderately steep soil is commonly at or near the base of steeper soils. In some places it is on narrow ridges and benches below the main part of the uplands. Areas are commonly 5 to 60 acres.

Included with this soil in mapping are less well drained Loudon soils. Edenton soils underlain by limestone bedrock are included on the lower part of the slopes, and Lawshe soils that have a darker colored, finer textured surface layer are included on the side slopes.

The hazard of erosion is a severe limitation for farming. Slope and slow permeability in the lower part of the subsoil are severe limitations for many nonfarm uses. Capability unit IVe–3; woodland suitability group 3o2.

Johnsburg Series

The Johnsburg series consists of somewhat poorly drained, gently sloping to sloping soils that formed in loess and the underlying material weathered from sand-

thick. The subsoil extends to a depth of 45 inches. The upper 6 inches is yellowish-brown silt loam. The next 6 inches is yellowish-brown silty clay loam that has mottles of gray and yellowish brown. The next 8 inches is yellowish-brown silty clay loam that has gray and light brownish-gray mottles. The next 8 inches is firm and brittle, yellowish-brown silty clay loam that has light brownish-gray and strong-brown mottles. The lower 9 inches is firm and brittle, light yellowish-brown silty clay loam that has light brownish-gray and strong-brown

brownish-gray (10YR 6/2) mottles and few, fine, distinct, strong-brown (7.5YR 5/6) mottles; weak, very coarse, prismatic structure parting to weak, thick, platy and weak, coarse, subangular blocky; firm and brittle; thin, patchy, dark-gray (10YR 4/1) clay films on vertical ped faces; common, fine, distinct, very dark brown (10YR 2/2) stains and concretions; thin, very patchy, light-gray (10YR 7/2), dry silt coatings on vertical and horizontal ped faces; 10 percent sandstone fragments; very strongly acid: gradual, wavy boundary.

IIC—45 to 60 inches, variegated yellowish-brown (10YR 5/4 and 5/6), light brownish-gray (10YR 6/2), and strong-

[redacted]

one-half acre that are more droughty because they contain layers of loose sand and gravel.

4 percent coarse fragments; mildly alkaline, calcareous; abrupt, wavy boundary.

B2 12 to 18 inches yellowish-brown (10YR 5/6) silty clay;

are 150 to 650 feet wide and as much as one mile long. In a representative profile in a cultivated area, the

Figure 6.—**High-quality forage crops are grown on Loudon soils where generally the grazing season is long and the forage yields are high**

um, prominent, gray (10YR 5/1) mottles; weak, coarse, prismatic structure; very firm; few roots along vertical ped faces; moderately alkaline, calcareous; gradual, smooth boundary.

IIIC1—58 to 70 inches, reddish-gray (10YR 5/1) silty clay loam; common, medium, prominent, light greenish-gray (5BG 7/1) mottles; weak, thick, platy structure; very firm; moderately alkaline, calcareous; clear, smooth boundary.

IIIC2—70 to 81 inches, variegated reddish-gray (10YR 5/1), yellowish-brown (10YR 5/4 and 5/8), and light greenish-gray (5BG 7/1) partly weathered silty clay loam shale; moderate, thick, platy (rock) struc-

Beasley and Guernsey soils, part of their solum formed in glacial till. Loudon soils are deeper to bedrock than Edenton soils, and they lack the fragipan of the Rossmoyne soils.

LoB—Loudon silt loam, 2 to 6 percent slopes. This gently sloping soil is on broad ridgetops, near the base of steeper soils, and on narrow ridges below the main part of the uplands. Areas cover 2 to 50 acres. This soil has a profile similar to the one described as representative of the series, but its surface layer is thicker, it has better tilth, and it is deeper to shale residuum. Its root zone is

near the base of steeper soils and on narrow ridges below the main part of the uplands. Areas cover 2 to 50 acres. This soil has the profile described as representative of the

14 inches is yellowish-brown heavy silty clay loam. The lower 15 inches is yellowish-brown silty clay that has

[redacted]

IIB3tg—32 to 40 inches, gray (10YR 5/1) silty clay; many, fine, distinct, strong-brown (7.5YR 5/6) mottles and few, fine distinct, dark yellowish-brown (10YR 4/4) mottles; moderate, medium, prismatic structure parting to moderate, fine and medium, subangular and angular blocky; firm; thin, patchy, dark-gray (N 4/0) clay films on ped faces; neutral; gradual, irregular boundary.

IIC1—40 to 47 inches, gray (10YR 6/1) silty clay; common, medium, distinct, yellowish-brown (10YR 5/6) mottles; weak, fine, subangular and angular blocky structure; firm; mildly alkaline, calcareous; gradual, wavy boundary.

IIC2—47 to 60 inches, gray (10YR 6/1) clay; common, medium, distinct, yellowish-brown (10YR 5/6) mottles; weak, thick, platy structure; firm; mildly alkaline, calcareous.

The solum is 24 to 60 inches thick, but it commonly is 30 to 48 inches thick. The loess mantle is 6 to 24 inches thick, but it is commonly 14 to 20 inches thick. Mottles that have a chroma of 2 or less occur below the Ap horizon.

The Ap horizon is dark grayish brown (10YR 4/2), grayish brown (10YR 5/2), or dark brown (10YR 4/3).

inches is mottled, yellowish-brown clay loam. The substratum is yellowish-brown clay loam to a depth of 36 inches and yellowish-brown loam that is firm and compact to a depth of 60 inches.

The available water capacity is medium in Miamian soils. Permeability is moderately slow, and surface runoff is medium to rapid, depending on slope. The root zone is moderately deep and is neutral to strongly acid.

Miamian soils are used mainly for farm crops. The main crops are corn, soybeans, wheat, and grass-legume mixtures for hay and pasture. Much of the acreage of the steeper Miamian soils is in permanent pasture or is wooded.

Representative profile of Miamian silt loam, 2 to 6 percent slopes, in a cultivated field 2½ miles west of Highland on State Route 28, 1 mile on McVey Road, 400 feet southeast of Clinton County line, and 75 feet south of McVey Road, in Fairfield Township:

Ap—0 to 7 inches, dark grayish-brown (10YR 4/2) silt loam;

and 7.5YR 3/2), and brown (7.5YR 5/4 and 4/4). The B1t and B2t horizons range from silty clay loam to clay.

The C horizon is commonly yellowish brown (10YR 5/4) or brown (10YR 4/3).

Miamian soils are part of the drainage sequence that in

in long, irregularly shaped areas on hillsides and in narrow bands on the sides of valleys that parallel streams and drainageways. It is also in small irregularly shaped areas on the till plain. The areas range from 2 to 40 acres

The hazard of erosion is moderate, and some measures for controlling erosion are needed if these soils are cultivated. Moderately slow permeability is the main limitation for nonfarm uses. Capability unit IIe-1; woodland suitability group 2o1.

MrB2—Miamian-Russell silt loams, 2 to 6 percent slopes, moderately eroded. This mapping unit is about 60 percent Miamian soils and 40 percent Russell and other soils. These gently sloping soils are mainly along minor drainageways but also occupy broad, convex areas and narrow ridges in the uplands. The areas vary widely in width and length and range from 3 to 30 acres in size. Slopes are long to short.

Profiles of these soils differ from the profiles described as representative of the Miamian and Russell series in

The altered soil material in this complex has poor physical condition. The content of organic matter and the available water capacity are reduced. The surface layer has a higher content of clay, which causes the tilth to be poor and increases the tendency of the soil material to harden upon drying. These unfavorable conditions for vegetation and the hazard of erosion are limitations of this complex. Capability unit and woodland suitability group not assigned.

Millsdale Series

The Millsdale series consists of dark-colored, very poorly drained, nearly level soils that formed in glacial till or outwash that is mantled with loess as much as 15

IIIC—30 to 32 inches, light yellowish-brown (10YR 6/4) sandy clay loam; common, medium, distinct, grayish-brown (10YR 5/2) mottles; massive; very friable; 15 percent limestone fragments; moderately alkaline, calcareous.

IIIR—32 inches, limestone bedrock.

The solum is 20 to 40 inches thick, and the loess mantle or

thick. The subsoil extends to a depth of 29 inches. The upper 3 inches is yellowish-brown heavy silt loam. The next 4 inches is brown silty clay loam. The next 5 inches is dark yellowish-brown heavy clay loam. The next 8 inches is yellowish-brown clay. The substratum is light yellowish brown and very pale brown loam and sandy

grayish brown (10YR 3/2), very dark brown (10YR 2/2), or black (10YR 2/1). The A2 horizon is 3 to 6 inches thick and is pale brown (10YR 6/3) or yellowish brown (10YR 5/4).

The B horizon has a hue of 10YR, 7.5YR, and 5YR, a value of 4 and 5, and a chroma of 3 and 4. Thin or medium, patchy or continuous clay films are dark yellowish brown (10YR 4/4) or brown (7.5YR 4/4) or (10YR 4/3). This horizon is silty clay loam, clay loam, and clay.

Some profiles have a C horizon of residuum that weathered

sentative of the series, but the surface layer is thinner and a mixture of the original surface layer and subsoil.

Included with this soil in mapping are small areas of Miamian and Opequon soils. Also included are small areas of slightly eroded Milton soils in woodland and a few areas of severely eroded Milton soils.

Slope and erosion are limitations to farm use. Slope,

bedrock in many places. It contains some loose rock fragments and rock outcrops, and many areas have no plant cover.

Included with this soil in mapping are areas of slightly eroded Milton soils in places where the cover of vegetation is permanent. Areas of moderately eroded Milton soils and areas of steeper, shallower Opequon soils are also included.

This soil is not well suited to crops because of the severe hazard of erosion, rockiness, and slope. It is better suited to permanent vegetation. Depth to bedrock, slope, and erosion are severe limitations to many nonfarm uses. Capability unit IVe–3; woodland suitability group 2o1.

gray (N 5/0) clay films on ped faces; 3 percent pebbles; slightly acid; clear, wavy boundary.

B3t—36 to 42 inches, dark yellowish-brown (10YR 4/4) silty clay; many, fine and medium, distinct, gray (10YR 5/1) and dark-gray (10YR 4/1) mottles; weak, coarse, prismatic structure parting to weak, medium and coarse, subangular blocky firm; few roots; thin, patchy, dark-gray (N 4/0) clay films on vertical ped faces; neutral; gradual, wavy boundary.

C—42 to 60 inches, yellowish-brown (10YR 5/4) and dark yellowish-brown (10YR 4/4) clay; many, medium, distinct, dark-gray (10YR 4/1) and gray (10YR 5/1) mottles; weak, coarse, prismatic structure parting to weak, coarse, subangular blocky; firm; mildly alkaline, calcareous.

The solum is typically 30 to 42 inches thick, and in some

Montgomery Series

The Montgomery series consists of [illegible] derived

places it is 26 to 48 inches thick. The solum is commonly slightly acid to neutral increasing to mildly alkaline in the lower part of some profiles.

In a representative profile in a cultivated area the sum[illegible] The colum is 40 to 60 inches thick, and the depth to shal[illegible]

organic stains in old root channels and in pores; 15 percent sandstone fragments; very strongly acid; gradual, wavy boundary.

B2—13 to 20 inches, brown (7.5YR 4/4) channery silt loam; weak, fine and medium, subangular blocky structure; friable; common roots; thin, very patchy, silt coatings of pale brown (10YR 6/3) when moist and light gray (10YR 7/2) when dry on ped faces; thin, strong-brown (7.5YR 5/6) and brown (10YR 4/3) coatings of weathered material on sandstone fragments; 30 percent sandstone fragments; very strongly acid; wavy boundary.

C—20 to 25 inches, yellowish-brown (10YR 5/4) channery loam; very friable; few roots; thin, very patchy, silt coatings, pale brown (10YR 6/3) when moist and light gray (10YR 7/2) when dry on ped faces; thin, strong-brown (7.5YR 5/6), yellowish-red (5YR 4/6), and light brownish-gray (10YR 6/2) coatings of weathered material on fragments; 50 percent sandstone fragments; very strongly acid; gradual, wavy boundary.

R—25 inches, fine-grained sandstone bedrock.

The solum is 16 to 36 inches thick, and the depth to sandstone bedrock is 20 to 40 inches. Reaction in the B and C horizons is very strongly acid or extremely acid. Coarse fragments of sandstone make up 10 to 20 percent of the A horizon, 15 to 35 percent of the B horizon, and 35 to 70 percent of the C horizon.

The A horizon is silt loam or channery silt loam. The Ap horizon is dark grayish brown (10YR 4/2), yellowish brown (10YR 5/4), or brown (10YR 4/3 and 5/3). Profiles in undisturbed areas have an A1 horizon that is 1 to 3 inches thick and is very dark grayish brown (10YR 3/2) or dark brown (10YR 3/3).

The B horizon is yellowish brown (10YR 5/4 and 5/6) or brown (7.5YR 5/4 and 4/4). It is channery silt loam, channery loam, or channery light silty clay loam.

The C horizon has a hue of 7.5YR and 10YR, value of 4 and 5, and chroma of 4 and 6. Some profiles have thin, patchy and

yellowish-brown (10YR 5/4) and reddish-brown (5YR 4/4) clay films on ped faces; common, fine and medium, very dark brown (10YR 2/2) stains and

of the uplands are areas of Rossmoyne and Cincinnati soils, and along the edges of finer textured outwash and alluvium

ridges, breaks, and benches of terraces. Areas cover 2 to 20 acres. This soil has a profile similar to the one described as representative of the series, but the surface layer is

Included with these soils in mapping are areas of moderately and severely eroded Negley and Fox soils

horizontal ped faces; 45 percent sandstone fragments; slightly acid; clear, smooth boundary.

B21t—21 to 32 inches, yellowish-brown (10YR 5/6) channery silt loam; weak, fine and medium, subangular blocky structure; friable; few roots; thin, very patchy, yellowish-brown (10YR 5/4) and light yellowish-brown (10YR 6/4) clay films in old root channels, on sand grains, and on vertical and horizontal ped faces; thin, strong-brown (7.5YR 5/6) coatings on faces of some sandstone fragments; 60 percent sandstone fragments; slightly acid; gradual, smooth boundary.

B22t—32 to 40 inches, yellowish-brown (10YR 5/4) very channery loam; weak, fine medium, subangular blocky structure; friable; few roots; thin, very patchy, brown (7.5YR 5/4 and 4/4) clay films in old root channels, on sand grains and on ped faces; 70 percent sandstone fragments; slightly acid; diffuse, wavy boundary.

B3—40 to 54 inches, yellowish-brown (10YR 5/6) very flaggy loam; very weak, fine, subangular blocky structure; friable; few roots; 70 percent flaggy and channery sandstone fragments; strongly acid; diffuse, wavy boundary.

C—54 to 60 inches, yellowish-brown (10YR 5/6) loamy material as a coating on sandstone fragments; friable; 90 percent sandstone fragments; strongly acid; diffuse, wavy boundary.

R—60 inches, acid Berea sandstone; some fractures that decrease in number with increasing depth; a thin zone of slightly weathered loamy material on the surface of some of the fragments.

The solum is 36 to 54 inches thick, and the depth to bedrock is 40 to 60 inches. Content of channery- and flaggy-size sandstone fragments is 20 to 50 percent in the upper part of the solum and more than 50 percent in the lower part. The solum ranges from slightly acid to strongly acid in the A horizon and upper part of the B horizon to very strongly acid in the lower part.

brittle silt loam that has yellowish-brown and light brownish-gray mottles. The next 8 inches is yellowish-brown, firm and slightly brittle silty clay loam that has light brownish-gray and strong-brown mottles. The next 8 inches is yellowish-red clay that has light olive-brown mottles. The next 17 inches is strong-brown clay that has light olive-brown mottles. The lower 7 inches is strong-brown silty clay that has light olive-brown and gray mottles. Below a depth of 74 inches is limestone bedrock.

The available water capacity is medium in Nicholson soils. Permeability is slow, and surface runoff is medium. The root zone is moderately deep and is medium acid to very strongly acid.

Nicholson soils are used mainly for corn, wheat, and grass-legume mixtures grown for hay and pasture. Some soybeans and tobacco are also grown. A considerable acreage is in permanent pasture, and a small acreage is in woodland or is idle.

Representative profile of Nicholson silt loam, 2 to 6 percent slopes, in a cultivated field, ¼ mile south of Elmville on Elmville South Road, and 1.4 miles southwest on and 140 yards west of Walnut Shade Road, in Brush Creek Township:

Ap—0 to 8 inches, brown (10YR 5/3) silt loam; moderate, fine and medium, subangular blocky structure; very friable; many roots, strongly acid; abrupt, smooth boundary.

B1—8 to 14 inches, yellowish-brown (10YR 5/4) silt loam; many, medium, faint, yellowish-brown (10YR 5/6)

many, fine, prominent, black (10YR 2/1) stains and concretions; neutral; gradual, wavy boundary.

IIB32—50 to 67 inches, strong-brown (7.5YR 5/6) clay; common, fine, distinct, light olive-brown (2.5Y 5/4) mottles; moderate and strong, very fine and fine, angular blocky structure; very firm; yellowish-brown (10YR 5/4) pressure faces on horizontal ped faces; many, fine, prominent, black (10YR 2/1) stains and concretions; neutral; clear, wavy boundary.

IIB33—67 to 74 inches, strong-brown (7.5YR 5/8) silty clay; common, fine, distinct mottles of light olive brown (2.5Y 5/4) and few, fine, distinct mottles of gray (10YR 6/1); massive; firm; common, fine, prominent, black (10YR 2/1) stains and concretions; mildly alkaline; abrupt, wavy boundary.

IIR—74 inches, limestone bedrock.

The solum is 42 to 80 inches thick. The depth to limestone bedrock is 48 to 90 inches in most places but 50 to 75 inches in some places. Depth to the fragipan is 20 to 30 inches. The solum ranges from medium acid to very strongly acid from the Ap horizon through the fragipan and to mildly alkaline in the lower part of the solum.

The Ap horizon is dark grayish brown (10YR 4/2), grayish brown (10YR 5/2), and brown (10YR 4/3 and 5/3). In undisturbed areas, the A1 horizon is very dark grayish brown (10YR 3/2), very dark gray (10YR 3/1), or dark gray (10YR 4/1) and 1 to 4 inches thick. In some profiles the A2 horizon is light yellowish brown (10YR 6/4), pale brown (10YR 6/3), brown (10YR 5/3 and 4/3), or grayish brown (10YR 5/2) and 2 to 8 inches thick.

The B horizon and the fragipan have a hue of 10YR and 7.5YR, a value of 3 through 5, and a chroma of 4 or 6. The B1 horizon is silt loam, and the B2 horizon is silt loam or silty clay loam. In some profiles, the mottles below the upper 10 inches of the B2 horizon have a hue of 10YR, a value of 5 or 6, and a chroma of 1 or 2. The fragipan is silt loam and silty clay loam. The B2 and Bx horizons have thin to medium, very patchy and patchy clay films in a hue of 10YR or 7.5YR, a value of 3 through 5, and a chroma of 1 through 6. In these horizons are silt coatings of pale brown (10YR 6/3), light yellowish brown (10YR 6/4), and light gray (10YR 7/1 and 7/2) on the ped faces. The B3 horizon is yellowish red (5YR 4/6), reddish brown (5YR 4/4 and 4/3), strong brown (7.5YR 5/6 and 5/8), reddish brown (2.5YR 4/4), or red (2.5YR 4/6).

In some profiles the C horizon has variegated colors of pale brown (10YR 6/3), light yellowish brown (10YR 6/4), light gray (10YR 6/1), or yellowish brown (10YR 5/4 and 5/6). This horizon is clay loam to sandy loam.

Nicholson soils are adjacent to or closely associated with well-drained Bratton soils. They are deeper to limestone bedrock than Bratton soils, and they have a fragipan. Unlike Johnsburg soils, Nicholson soils are underlain by limestone bedrock. Their lack stratification in the lower part of the

limitations to nonfarm uses. Capability unit IIe–2; woodland suitability group 2o1.

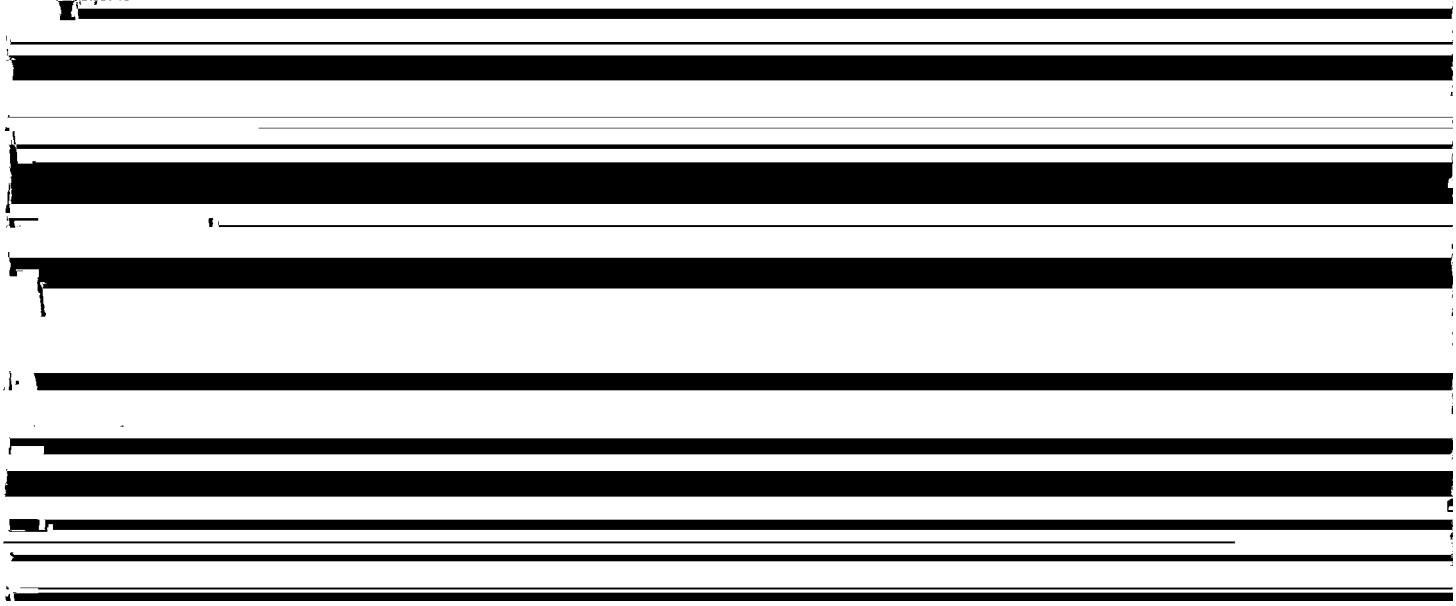
NnB2—Nicholson silt loam, 2 to 6 percent slopes, moderately eroded. In most places this gently sloping soil occurs as long, narrow and medium bands at the head of and along minor drainageways; in other places it occurs as narrow to broad areas on ridgetops. The soil areas have both concave and convex surfaces and cover 2 to 20 acres. This soil has the profile similar to the one described as representative of the series, but the plow layer contains browner subsoil material, because the original surface layer has been partly removed by erosion. The fragipan is nearer the surface, and consequently the root zone is thinner and the available water capacity is less. There are a few sinkholes.

Included with this soil in mapping are areas of slightly eroded Nicholson soils that are mainly in woodland and areas of severely eroded Nicholson soils that are dissected by shallow gullies. In these areas chert and limestone fragments and in some places the upper part of the fragipan are exposed. Also included are areas of Bratton soils that are more sloping and eroded and a few areas of a somewhat poorly drained soil that occurs as narrow bands along and at the head of drainageways.

Erosion is the main limitation to farm use. Depth to bedrock and slow permeability are limitations to nonfarm uses. Capability unit IIe–2; woodland suitability group 2o1.

NnC2—Nicholson silt loam, 6 to 12 percent slopes, moderately eroded. This sloping soil is on the sides of ridges and along minor drainageways. Generally, it has short slopes. It is in long areas that range from 2 to 44 acres, but generally cover 5 to 20 acres. Areas of this soil commonly are adjacent to and upslope from the steeper Opequon soils. This soil has a profile similar to the one described as representative of the series, but the present plow layer contains browner subsoil material because part of the original surface layer has been removed by erosion. Also, the fragipan is nearer the surface, and the available water capacity is slightly less.

Included with this soil in mapping are areas of severely eroded Nicholson soils that are dissected by shallow



Illinoian age. The native vegetation was hardwood forest in which hickory, oak, and sugar maple were dominant.

IIB24t—33 to 42 inches, yellowish-brown (10YR 5/4) gravelly loam; weak, medium, subangular blocky structure; [illegible] four roots [illegible] [illegible] (7.5YR 4/4)

acres. In the areas of glacial landforms, these soils are closely associated with Fox and Miamian soils. This soil has the profile described as representative of the series.

Included with this soil in mapping are some areas of Ockley soils that have a thicker, finer-textured surface layer, because they receive deposition of soil material from the more sloping surrounding soils. Also included are areas of Fox soils and moderately eroded, sloping Ockley soils that have a surface layer of loam or clay loam that in some places contains spots of gravel. Other inclusions in slight depressions at the head of and along drainageways are areas of Thackery and Sleeth soils. These soils occur as narrow bands along the drainageways.

The hazard of erosion is moderate, and some measures for controlling erosion are needed if the soil is used for crops. This soil is suited to nursery crops, truck farming, and sod production. Slope and rapid permeability of the underlying sand and gravel are limitations to some nonfarm uses. Capability unit IIe-1; woodland suitability group 1o1.

OcC2—Ockley silt loam, 6 to 12 percent slopes, moderately eroded. This sloping soil is on stream terraces and in areas adjacent to kames, eskers, and end moraines. Where they are adjacent to glacial landforms, the soil areas are irregularly shaped, but on the stream terraces they are elongated and somewhat irregularly shaped. They cover 3 to 15 acres. This soil is closely associated with the Fox soils. It has a profile similar to the one described as representative of the series, but the plow layer now consists of browner subsoil material, because part of the original surface layer has been removed by erosion. The plow layer contains many spots of gravel.

Included with this soil in mapping are areas of moder-

Opequon Series

The Opequon series consists of well-drained, sloping to very steep soils that formed in thin deposits of loess and residuum weathered from limestone. These soils are on dissected unglaciated uplands. The native vegetation was hardwood forest of mixed oak. At present, redcedar invades unmanaged pasture and abandoned fields.

In a representative profile in a cultivated area, the surface layer is brown silt loam 5 inches thick. The subsoil extends to a depth of 15 inches. The upper 3 inches is yellowish-red heavy silty clay loam. The lower 7 inches is dark reddish-brown clay. The substratum, to a depth of 19 inches, is pale-brown and strong-brown sandy loam. Below a depth of 19 inches is limestone bedrock.

The available water capacity is low in Opequon soils. Permeability is moderate to slow, and surface runoff is moderate to rapid, depending on the slope. The root zone is shallow and commonly medium acid to neutral.

Opequon soils are used mainly for grass-legume mixtures grown for hay and permanent pasture. Corn, wheat, and soybeans are grown in the less eroded sloping areas. A considerable acreage in the steeper areas is in forest, or is idle and reverting to forest.

Representative profile of Opequon silt loam, 6 to 18 percent slopes, moderately eroded, in a cultivated field 2½ miles west of Sinking Spring, 330 yards south of the intersection of Sinking Spring and Cedar Chapel Roads, 330 yards south of Cedar Chapel Church, and 40 feet east of Cedar Chapel Road, in Brush Creek Township:

Ap—0 to 5 inches, brown (10YR 4/3) silt loam; weak, medium, subangular blocky structure; friable; many roots; neutral; abrupt, smooth boundary.

The thin calcareous C horizon is light yellowish brown (10YR 6/4), strong brown (7.5YR 5/6) or pale brown (10YR 6/3). Some profiles have a mantle of glacial till that is mod-

length, that extend along streams and drainageways for several hundred feet. They range from 3 to 36 acres, but are generally 5 to 25 acres.

short, convex side slopes that parallel the streams and drainageways for several hundred feet. They range from 2 to 35 acres but are generally 5 to 20 acres. This soil commonly is adjacent to and upslope from the steeper Opequon or Cascade soils and near the Bratton and

and 15 feet south of farm lane, in southeastern Liberty Township:

Ap—0 to 8 inches, dark grayish-brown (10YR 4/2) silt loam; weak, fine, granular structure; friable; many roots; neutral; abrupt smooth boundary.

Nicholson soils.

This soil has a profile similar to the one described as representative of the series, but the surface layer has a high content of clay because it consists mainly of the browner, finer textured subsoil material. This soil is quite shallow, because it is severely eroded. There are many more bedrock outcrops and more shallow and deep gullies that expose more limestone fragments, chert, and geodes at the surface (fig. 9) than on the less eroded Opequon soils. Because of the clayey surface layer and the slope, this soil is difficult to till. During dry seasons, many cracks that are as much as 1½ inches wide form polygonal designs on the surface. These cracks extend to the underlying bedrock in places.

Included with this soil in mapping, between gullies and at the bottom of slopes, are less eroded areas of Opequon silt loam. Also included are small areas of Bratton or Milton soils and Cascade soils. Also included are many

A2—8 to 14 inches, brown (10YR 4/3) silt loam; weak, thick platy structure; friable; common roots; medium acid; clear, wavy boundary.

B1—14 to 19 inches, yellowish-brown (10YR 5/4) silt loam; weak, medium, subangular blocky structure; friable; common roots; medium acid; clear, wavy boundary.

B21t—19 to 26 inches, brown (10YR 4/3) and dark yellowish-brown (10YR 4/4) silt loam; weak, medium, subangular blocky structure; friable; few roots; thin, very patchy, brown (10YR 4/3) clay films on ped faces; medium acid; clear, wavy boundary.

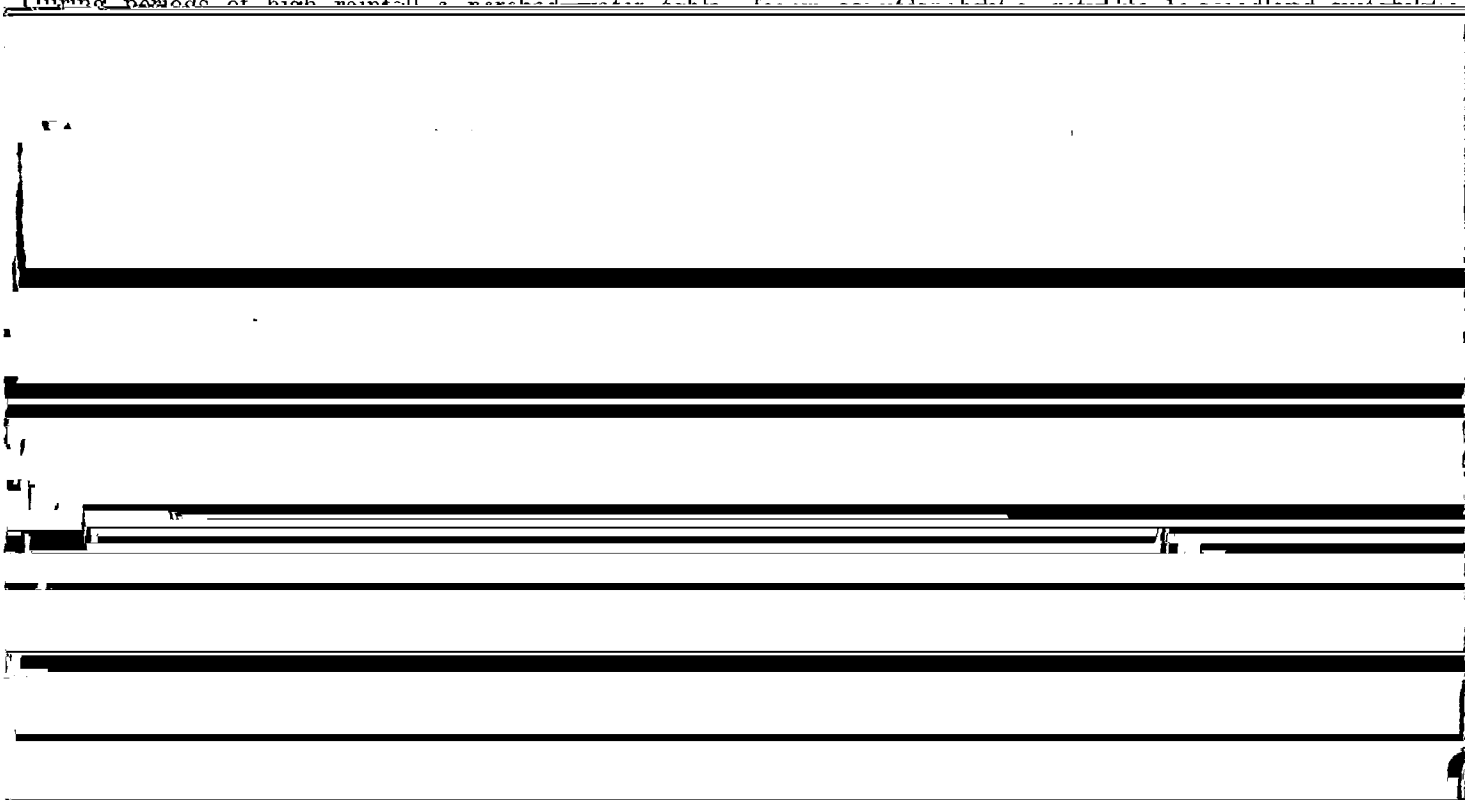
B22t—26 to 32 inches, yellowish-brown (10YR 5/4) silty clay loam; moderate, medium, subangular blocky structure; friable; few roots; thin, patchy, pale-brown (10YR 6/3) clay films on ped faces; strongly acid; clear, wavy boundary.

IIBx1—32 to 43 inches, yellowish-brown (10YR 5/6) silty clay loam; common, medium, distinct, light-gray (10YR 6/1) mottles; weak, very coarse, prismatic structure parting to moderate, thick, platy; firm and brittle; few roots; thick, continuous, gray (10YR 5/1) clay films on vertical ped faces and medium.

Figure 9.—**Pasture, near Fairfax, on Opequon clay, 6 to 18 percent slopes, severely eroded.**

25 acres. This soil has the profile described as representative of the series. The surface layer erodes easily. During periods of high rainfall a perched water table

Slope and erosion are severe limitations to farm use. Slope and very slow permeability are limitations to non-



Included with this soil in mapping are a few areas of [redacted]

A12—8 to 16 inches, black (10YR 2/1) silty clay loam, very dark brown (10YR 2/2) crushed; common, fine.

[redacted]

glacial till of Illionian age rather than of Wisconsin Age. They have a thicker dark-colored A horizon than Blanchester soils.

Pa—Patton silt loam. This soil is in nearly level to depressed terrace areas along streams and drainageways, in lakebed and slack water areas, at the head of drainageways, and commonly adjacent to steep sloping areas and escarpments. The areas are narrow to broad, elongated, and in places irregularly shaped. At the head of drainageways they are fan shaped. The areas cover 5 to 20 acres.

This soil has a profile similar to the one described as representative of the series, but the substratum of till below a depth of 55 inches is lacking. Consequently the substratum has less strength. This soil is subject to seepage and to deposition of soil material from surrounding, more sloping areas. It is also subject to ponding.

Included with this soil in mapping are areas of Westland soils and some small areas of Fitchville soils. Also included are some areas of Patton soils that have a surface layer of silty clay loam and loam.

clay that has dark yellowish-brown and yellowish-brown mottles. The substratum, to a depth of 97 inches, is gray silty clay loam that has light yellowish-brown mottles.

The available water capacity is medium in Peoga soils. Permeability is slow, and surface runoff is slow to very slow. These soils have a high water table during winter and spring, and they dry out slowly after rains. The root zone is deep, and is commonly medium acid to very strongly acid.

Peoga soils are used mainly for corn, soybeans, wheat, and grass-legume mixtures for hay and pasture. A small part is in woodland, and some is idle.

Representative profile of Peoga silt loam, in a cultivated field 1¾ miles southeast of Marshall on State Route 506 and Turkey Road, 0.9 mile south of the intersection of State Route 506 and Turkey Road, 530 yards west of Turkey Road, and 125 yards east of woods, in Marshall Township:

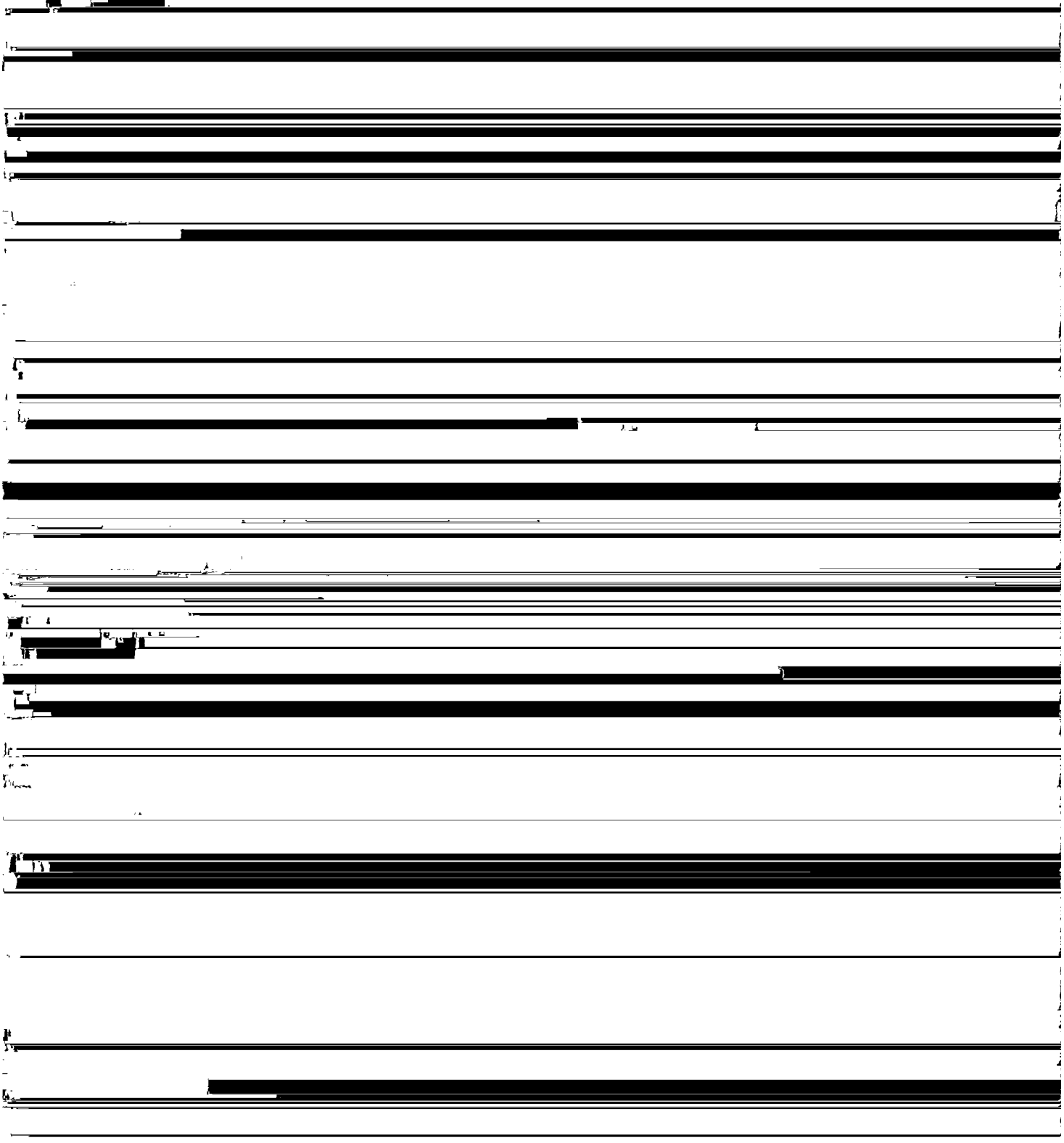
Ap—0 to 9 inches, grayish brown (10YR 5/2) silt loam;

has a matrix color of gray (10YR 6/1 and 5/1) and mottles of yellowish brown (10YR 5/4 and 5/6) and light yellowish brown (10YR 6/4).

The B horizon commonly has matrix colors of gray (10YR 6/1 and 5/1) and (N 5/0) or dark gray (N 4/0) and mottles of yellowish brown (10YR 5/4 and 5/6) or strong brown (7.5YR [redacted]

structure parting to moderate, fine, granular; very friable; common roots; strongly acid; clear, wavy boundary.

B22—16 to 28 inches, yellowish-brown (10YR 5/4) loam; few, medium, faint, dark yellowish-brown (10YR 4/4) mottles and common medium, distinct, light brownish-gray (10YR 6/2) mottles; weak, fine and medium



a depth of 29 inches is brown silt loam. The substratum extends to a depth of 81 inches. The upper 26 inches is brown loam. The next 18 inches is dark yellowish brown

Rn—Ross silt loam. This nearly level soil is on flood plains, more commonly along the larger streams. The areas cover 5 to more than 100 acres

4/3) clay films; thin, patchy, light brownish-gray (10YR 6/2) silt coatings on vertical ped faces; very strongly acid; clear, wavy boundary.

IIBx1—23 to 37 inches, yellowish-brown (10YR 5/4) light clay loam; common, fine, distinct, gray (10YR 5/1) mottles; moderate, very coarse, prismatic structure parting to moderate, thick, platy; very firm, brittle; few roots on prism faces; common tubular pores; medium, continuous, dark yellowish-brown (10YR 4/4) clay films inside prisms and gray (10YR 5/1) clay films on prism faces; thick, patchy, pale-brown (10YR 6/3) silty films on prism faces; 5 percent till pebbles; very strongly acid; gradual, wavy boundary.

IIBx2—37 to 56 inches, yellowish-brown (10YR 5/4) loam;

and on convex ridgetops and slope noses above and adjacent to steeper soils. In some places it surrounds flat areas of wetter soils. Areas range from 2 to more than 100 acres.

This soil has the profile described as representative of the series. The surface layer is easily eroded. During periods of heavy rainfall, a perched water table develops because the fragipan restricts permeability.

Included with this soil in mapping are Avonburg soils and spots of poorly drained soils in small drainageways. Some areas of more sloping Cincinnati soils and

streams and in narrow strips above steeper soils. Areas cover 2 to 15 acres. This soil has a profile similar to the one described as representative of the series, but erosion has removed part of the original surface layer and plowing has mixed subsoil material into the plow layer. The fragipan is nearer the surface, the available water capacity is lower, and tilth is poorer.

Included with this soil in mapping are sloping to steep, well-drained Cincinnati soils and Boston-Bratton complexes that have limestone residuum in the lower part of the subsoil. Also included are areas of soils that lack a fragipan and are less than 45 inches deep to carbonates.

Slope and erosion are limitations for farming. Slow permeability in the fragipan and slope are limitations for many nonfarm uses. Capability unit IVe-2; woodland suitability group 2r1.

RsC3—Rossmoyne silty clay loam, 6 to 12 percent slopes, severely eroded. This sloping soil is along streams and in narrow strips adjacent to and above steeper soils. Areas cover 2 to 15 acres. This soil has a profile similar to the one described as representative of the series, but most of the original surface layer has been removed by erosion and the plow layer is mostly subsoil material. The fragipan is considerably nearer the surface. Because it is eroded, this soil is shallow, droughty, and difficult to till.

Included with this soil in mapping are moderately steep, severely eroded Rossmoyne soils and small areas of Hickory soils. In some places Boston-Bratton complexes are included. Most of these areas have limestone outcrops. Slope and erosion are severe limitations for farming

limitations for nonfarm uses. Capability unit IVe-2; woodland suitability group 2o1.

RtB—Rossmoyne-Urban land complex, gently sloping. This mapping unit is 30 to 50 percent disturbed soil material, and the rest is mainly Rossmoyne soils. Most areas are used for urban and industrial development. The altered soil material is in areas where cutting and filling have changed the original soil so that the profile cannot be recognized. The undisturbed Rossmoyne soils are in undeveloped lots, back parts of developed lots, playgrounds, and small tracts of woodland.

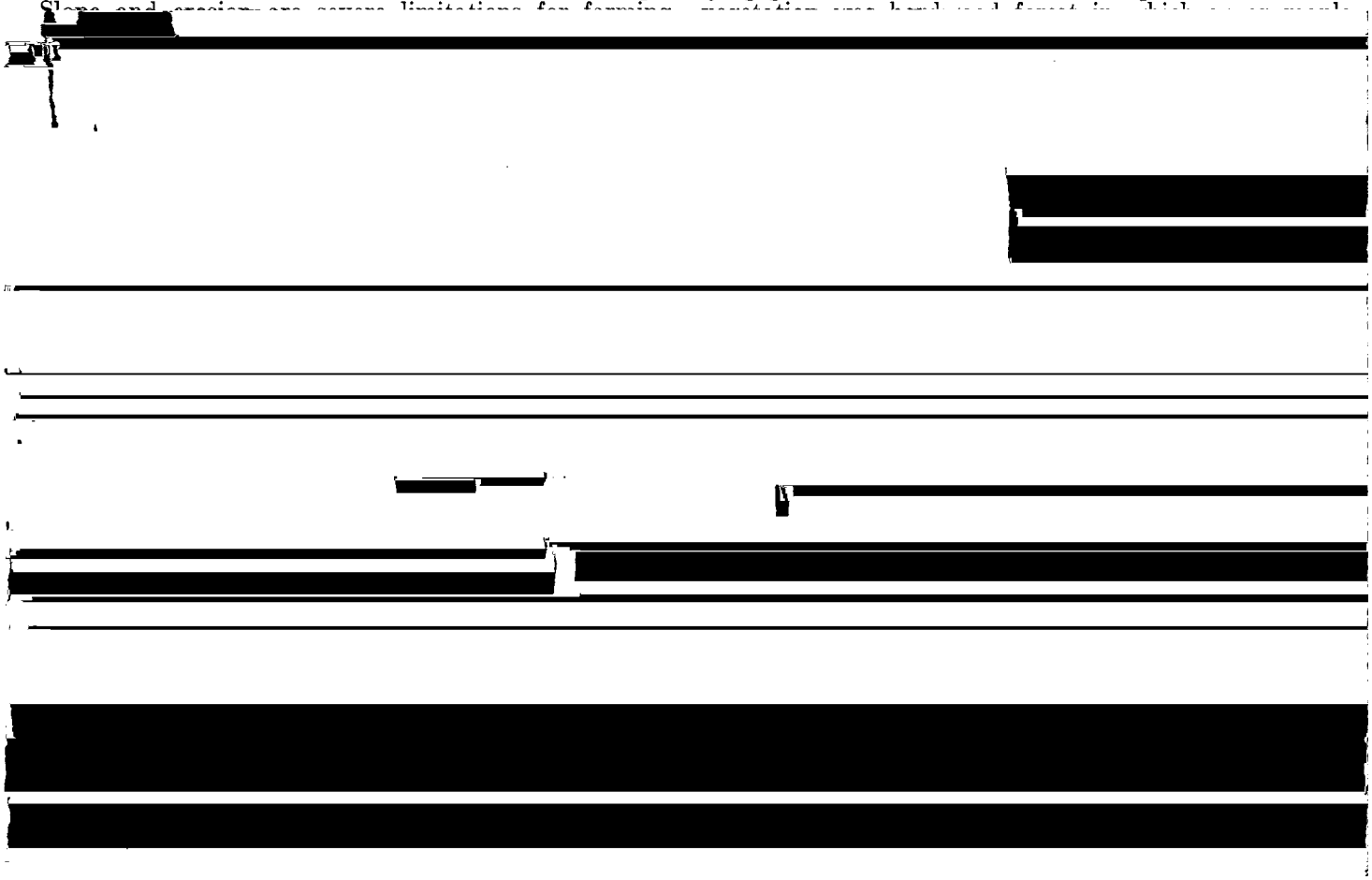
Included in mapping in the undisturbed areas are more sloping Rossmoyne soils, Cincinnati soils, and Boston-Grayford complexes.

The disturbed areas of this complex are in poor physical condition. The content of organic matter and available water capacity are reduced. The clay content of the surface layer is increased, which makes tilth poorer and increases the tendency of the soil to harden upon drying. The fragipan layer is difficult to excavate when the soil is dry.

These unfavorable conditions and a hazard of erosion are limitations for plants and construction. Capability unit and woodland suitability group not assigned.

Russell Series

The Russell series consists of well-drained, gently sloping to sloping soils that formed in loess and the underlying glacial till. These soils are on uplands. The native vegetation was hard wood forest in which



In a representative profile in a cultivated area the [redacted] been limed. The A2 and B1t horizons have a hue of 10YR.

Representative profile of Sardinia silt loam, 0 to 2 percent slopes, in a cultivated field 3 miles northeast of

(10YR 5/4), light yellowish-brown (10YR 6/4), or brown (10YR 5/3 and 4/3) and is 3 to 6 inches thick.

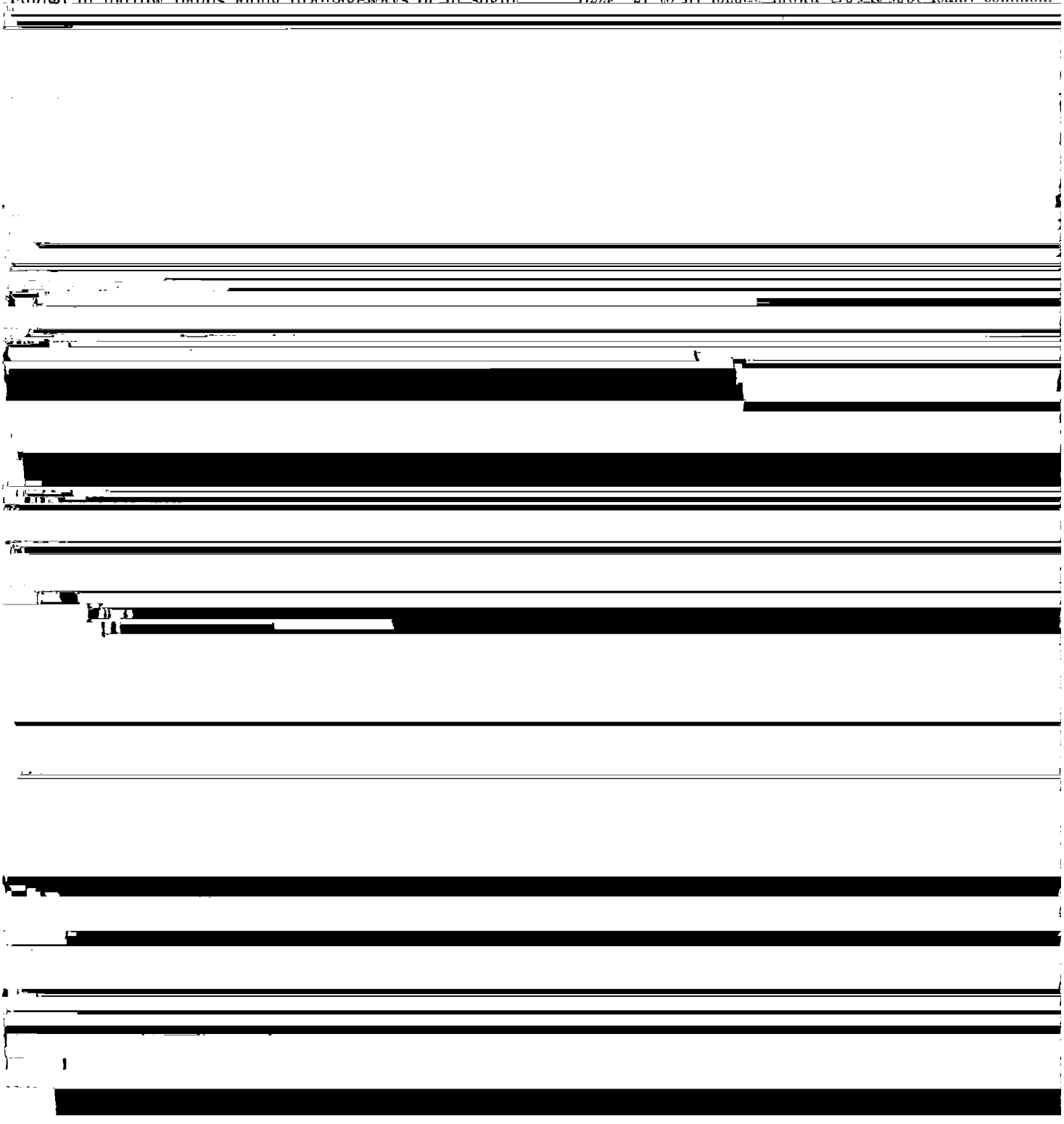
cover 3 to 15 acres. This soil is commonly adjacent to or associated with Ockley, Fox, and Genesee soils. It has a profile similar to the one described as representative of the series, but its surface layer contains subsoil material and is browner.

Included with this soil in mapping are a few areas of Fitchville soils. Dark-colored Westland soils are in-

brown (10YR 2/2) stains; neutral; gradual, wavy boundary.

B21g—12 to 21 inches, dark grayish-brown (10YR 4/2) loam; common, medium, distinct, gray (10YR 5/1) and dark yellowish-brown (10YR 4/4) mottles; weak, medium, prismatic structure parting to weak, medium, subangular blocky; friable; common roots; common, fine, distinct, very dark brown (10YR 2/2) stains; neutral; clear, wavy boundary.

B22g—21 to 34 inches, brown (10YR 5/3) loam; common,



are the main limitations for farming and are severe limitaticns for many nonfarm uses. Capability unit IIw–1; woodland suitability group 2w1.

Sleeth Series

The Sleeth series consists of somewhat poorly drained, nearly level soils that formed in loess or alluvium out-

moderate, medium, prismatic structure parting to moderate, medium, subangular blocky; firm; few roots; thin, continuous, dark grayish-brown (10YR 4/2) clay films on vertical ped faces and thin, patchy, brown (10YR 5/3) clay films on horizontal ped faces; few, fine, prominent, black (10YR 2/1) stains and concretions; 3 percent pebbles; neutral; clear, wavy boundary.

IIB22tg—27 to 36 inches, grayish-brown (10YR 5/2) silty clay loam; common, fine and medium, distinct,

SlA—Sleeth silt loam, 0 to 2 percent slopes. This nearly level to slightly depressional soil is on stream terraces. It is commonly adjacent to more sloping or steep soils and, in places, is between Ockley or Thackery soils and Westland soils. Areas are narrow to broad and somewhat irregularly shaped. They cover 3 to 20 acres.

Included with this soil in mapping are a few areas of dark-colored Westland soils in narrow bands along drainageways and in small depressions at the head of drainageways.

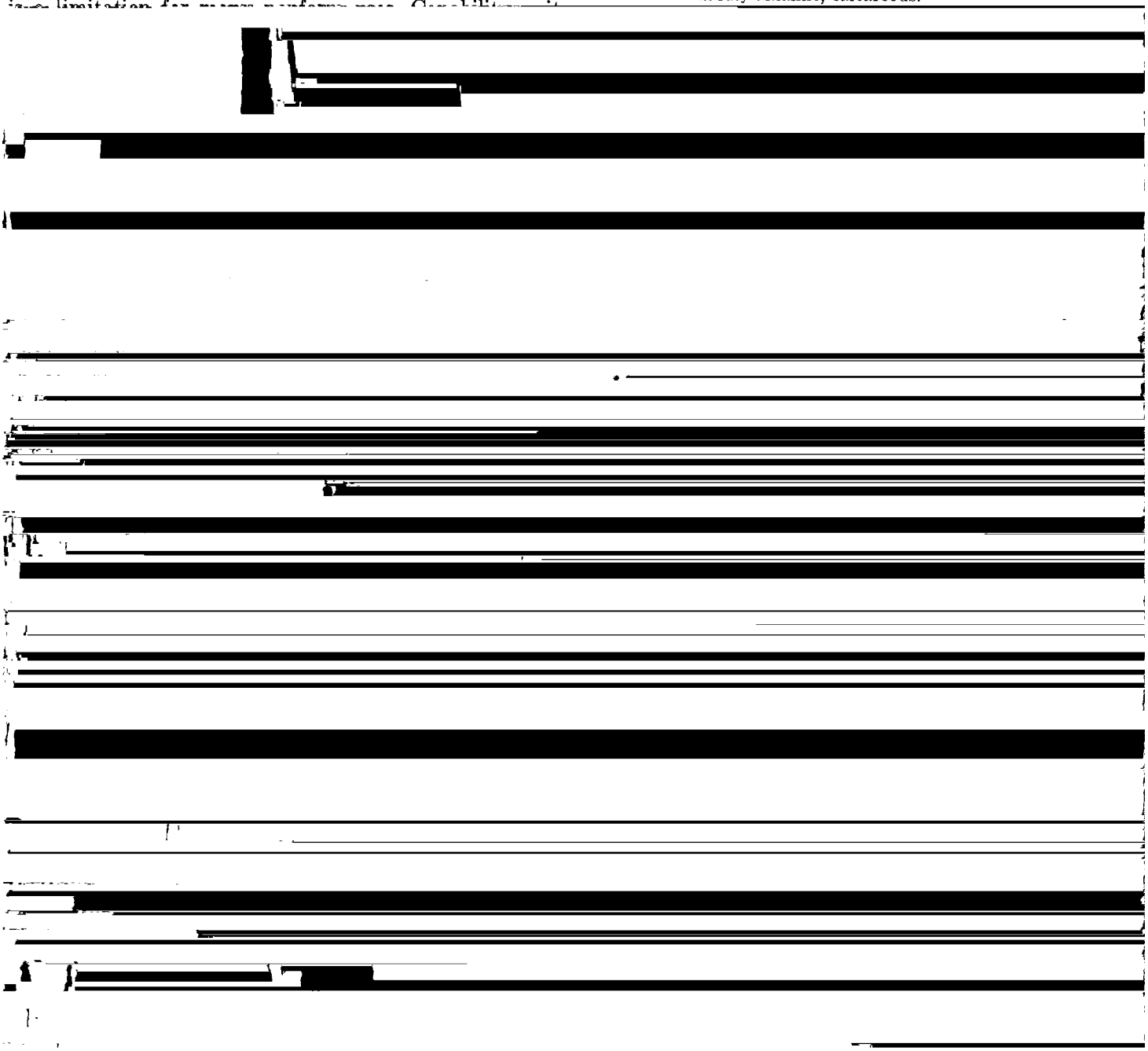
This soil receives much runoff and deposits of silty soil material from more sloping soils. The silty surface layer has a tendency to puddle when wet, crust when dry, and heave when it freezes. These characteristics, seasonal wetness, and ponding are limitations for farming. Wetness is a limitation for [illegible]

brown (10YR 5/6) mottles and many, medium, distinct, dark yellowish-brown (10YR 3/4) mottles; weak, medium and coarse, subangular blocky structure; friable; few roots; neutral; gradual, wavy boundary.

B3g—38 to 45 inches, dark-gray (10YR 4/1) sandy loam; many, medium, distinct, brown (10YR 5/3) and yellowish-brown (10YR 5/4) mottles; massive; friable; 5 percent pebbles; mildly alkaline; gradual, wavy boundary.

C1g—45 to 60 inches, dark-gray (10YR 4/1) and gray (10YR 5/1) loamy sand; common, medium, distinct, dark yellowish-brown (10YR 4/4) mottles and common, medium, prominent, dark-red (2.5YR 3/6) mottles; massive; very friable to loose; 5 percent pebbles; mildly alkaline, calcareous; clear, wavy boundary.

C2—60 to 70 inches, brown (10YR 5/3) and dark-gray (N 4/0) sand; single grained; loose; 10 percent pebbles; mildly alkaline, calcareous.



The available water capacity is low, and Stonelick soils tend to be droughty. Permeability is moderately rapid, and surface runoff is slow. These soils are subject to occasional flooding. The root zone is shallow and is commonly neutral to mildly alkaline.

Stonelick soils are used mainly for permanent pasture and woodland, although some corn, wheat, and oats are grown. A large acreage that is subject to periodic flooding

vegetation was hardwood forest in which beech, hickory, oak, and sugar maple were dominant.

In a representative profile in a cultivated area, the surface layer is dark grayish-brown silt loam 8 inches thick. The subsurface layer is brown silt loam 4 inches thick. The subsoil extends to a depth of 50 inches. The upper 6 inches is yellowish-brown silty clay loam. The next 12

IIC—50 to 62 inches, brown (10YR 5/3) and gray (10YR 5/1) sand and gravel; single grained; loose; 45 percent gravel and cobbles; mildly alkaline, calcareous.

The thickness of the solum and the depth to calcareous loose sand and gravel range from 40 to 60 inches. The loess or silty alluvium is 10 to 30 inches thick. Reaction in the solum is medium acid or strongly acid in the A2 horizon through the upper part of the B2t horizon, is medium acid or slightly acid in the lower part of the B2t horizon, and is neutral or mildly alkaline in the B3 horizon.

The Ap horizon has a hue of 10YR, value of 4 or 5, and chroma of 2 or 3. Profiles in undisturbed areas have an A1 horizon that is very dark grayish brown (10YR 3/2), very dark gray (10YR 3/1), or dark gray (10YR 4/1) and is 2 to 4 inches thick. The A2 horizon, or in some profiles an A&B horizon or a B&A horizon, is yellowish brown (10YR 5/4), brown (10YR 4/3 and 5/3), or light yellowish brown (10YR 6/4).

The B1t horizon and the upper part of the B2t horizon have a hue of 10YR and 7.5YR, value of 4 and 5, and chroma of 3 or 4. The lower part of this B2t horizon has a chroma of 2 or less. The Bt horizon is silty clay loam, clay loam, or sandy clay loam. The lower part of the B2t horizon is gravelly in some places. Clay films are thin and medium and very patchy to continuous. They have a hue of 10YR and 7.5YR, value of 3 to 5, and chroma of 3 to 6. Mottles that have a chroma of 2 or less begin at a depth of 12 to 26 inches. They are grayish brown (10YR 5/2), dark gray (10YR 5/1), and light brownish gray (10YR 6/2).

The B3 horizon commonly has a hue of 10YR, value of 4 and 5, and chroma of 0 to 4. It is silty clay loam, clay loam, or sandy clay loam and is gravelly in places.

The C horizon is commonly brown (10YR 5/3 and 4/3) or yellowish brown (10YR 5/4). In places it has mottles of gray (10YR 5/1), dark gray (10YR 4/1), and dark grayish brown (10YR 5/2). The colors of the matrix and mottles are reversed in some profiles.

loam that contains a small amount of gravel. Some areas of Ockley soils are also included.

The hazard of erosion is moderate, and some measures for controlling erosion are necessary if this soil is cultivated. The soil is suited to nursery crops, truck crops, and sod production. Slope and the rapid permeability in the underlying gravel and sand are limitations for some nonfarm uses. Capability unit IIe–1; woodland suitability group 1o1.

Trappist Series

The Trappist series consists of well-drained, gently sloping to steep soils that formed in loess and the underlying residual or colluvial material. They are on uplands, footslopes, and benches in the unglaciated part of the county. The native vegetation was a forest of oak, hickory, yellow-poplar, and pine.

In a representative profile, the surface layer is dark-gray silt loam 1 inch thick. The subsurface layer is brown silt loam 5 inches thick. The subsoil extends to a depth of 27 inches. The upper 3 inches is yellowish-brown silty clay loam that has brown mottles. The next 5 inches is brown silty clay loam. The next 7 inches is brown shaly silty clay. The lower 6 inches is brown very shaly silty clay loam. The substratum, to a depth of 32 inches, is dark-brown and yellowish-red very shaly silty clay loam. Shale bedrock is at a depth of 32 inches.

The available water capacity is medium to low in Trappist soils. Permeability is slow, and surface runoff

IIC—27 to 32 inches, dark-brown (7.5YR 4/4) and yellowish-red (5YR 4/6) very shaly silty clay loam; moderate, thin and medium, relict, platy structure and small pockets of weak, coarse, subangular blocky structure; firm; many light yellowish-brown (10YR 6/4), light brownish-gray (10YR 6/2), and pink (7.5YR 7/4) coatings on shale fragments; extremely acid; clear;

Included with these soils in mapping are a few areas of a moderately well drained soil in slight depressions and along drainageways. This soil formed in acid, clayey residuum weathered from shale. Also included are many areas of Wellston soils and a few areas of a redder, well-

[redacted]

A considerable part of this soil is in pasture or forest. The soil is more suited to permanent vegetation than to cultivated crops. Slope, susceptibility to erosion, soil slumping, depth to bedrock, and stoniness are limitations

A12—5 to 11 inches, very dark grayish-brown (10YR 3/2) silt loam; moderate, medium and coarse, granular structure; friable; common roots; slightly acid; gradual, wavy boundary.

A13—11 to 16 inches, very dark grayish-brown (10YR 3/2)

This soil receives runoff and seepage from adjacent more sloping areas. The hazard of droughtiness is moderate.

vertical ped faces; common, medium and coarse, distinct, very dark brown (10YR 2/2) stains and concretions; 35 percent pebbles; neutral; abrupt, irregular boundary.

more gravelly loam. Also included are a few areas of Warsaw soils.

sandstone; friable; some dark brown (7.5YR 4/4) clay films on fragments and in isolated pockets;

Westland Series

The Westland series consists of very poorly drained, nearly level soils that formed in loess or alluvium and

brown (10YR 5/2) mottles; massive; loose; 25 percent gravel; moderately alkaline; clear, wavy boundary.

C—48 to 62 inches, brown (10YR 5/3) sand and gravel; common, medium, distinct, grayish-brown (10YR 5/2) and yellowish-brown (10YR 5/6) mottles; single

severe limitations to nonfarm uses. Capability unit IIw–4; woodland suitability group 2w1.

Williamsburg Series

The Williamsburg series consists of well-drained, nearly level to moderately steep soils that formed in loess or alluvium and stratified outwash. These soils are on stream terraces in areas where the glacial material is of Illinoian age, but the nearby streams begin in areas where the glacial material is of late Wisconsin age. The native vegetation was hardwood forest, in which beech, hickory, oak, and maple were dominant.

In a representative profile, in a cultivated area, the surface layer is brown silt loam 9 inches thick. The subsurface layer is yellowish-brown silt loam 3 inches thick. The subsoil extends to a depth of 65 inches. The upper 18 inches of the subsoil is yellowish-brown silt loam

5/4) mottles; moderate, medium, subangular blocky structure; firm; few roots; thin, patchy, brown (7.5YR 4/4) clay films on vertical ped faces and thin, very patchy, brown (7.5YR 4/4) clay films on horizontal ped faces; common, fine, distinct, very dark brown (10YR 2/2) stains and concretions; 5 percent pebbles; very strongly acid; clear, wavy boundary.

IIB23t—30 to 37 inches, strong-brown (7.5YR 5/6) sandy clay loam; common, medium, faint, yellowish-brown (10YR 5/4) mottles; weak, medium, subangular blocky structure; friable; thin, very patchy, brown (7.5YR 4/4) clay films on ped faces; many, fine and medium, prominent, black (10YR 2/1) stains and concretions; 10 percent pebbles; strongly acid; clear, wavy boundary.

IIB31—37 to 42 inches, yellowish-brown (10YR 5/6) sandy clay loam; many, medium, distinct, light yellowish-brown (10YR 6/4) mottles; weak, medium, subangular blocky structure; friable; common, fine, distinct, very dark brown (10YR 2/2) stains and concretions; 15 percent pebbles; strongly acid; abrupt, wavy boundary.

poorly drained Fitchville soils, and very poorly drained, dark-colored Patton soils. Williamsburg soils do not have a fragipan, which is a characteristic of Otwell soils. The solum of Williamsburg soils is more acid than that of Ockley and Genesee soils. Williamsburg soils do not have an underlying layer of sand and gravel at a depth of 40 to 60 inches, which is a characteristic of Ockley soils.

WvA—Williamsburg silt loam, 0 to 2 percent slopes. This nearly level soil is on slightly convex stream terraces. The soil areas are moderately broad but in many places are elongated. They range from 3 to 35 acres in size but generally are 5 to 15 acres. This soil commonly is between the more sloping soils and the lower areas on terraces or flood plains. It has the profile described as representative of the series.

Included with this soil in mapping are a few areas of Sardinia and Fitchville soils that are in slight depressions, at the head of drainageways, and in narrow bands along drainageways. Also included are a few areas of Williamsburg soils that have a surface layer of loam that contains a small amount of gravel.

This soil is well suited to nursery crops, truck crops, [illegible] drainageways and in narrow bands along drainageways are also included.

Slope and moderate erosion are limitations to the use of this soil for farming. Also, the soil tends to be droughty. Slope is a limitation to nonfarm uses. Capability unit IIIe–1; woodland suitability group 1o1.

Xenia Series

The Xenia series consists of moderately well drained, nearly level to gently sloping soils that formed in loess and glacial till. These soils are on moraines and till plains. The native vegetation was hardwoods, in which maple, beech, oak, and hickory were dominant.

In a representative profile, in a cultivated area, the surface layer is brown silt loam 8 inches thick. The subsurface layer, to a depth of 11 inches, is yellowish-brown silt loam. The subsoil extends to a depth of 54 inches. The upper 4 inches is yellowish-brown silt loam. The next 7 inches is yellowish-brown silty clay loam. The next 6 inches is yellowish-brown silty clay loam mottled [illegible]

distinct, black (10YR 2/1) stains; 5 percent pebbles; medium acid; clear, wavy boundary.

IIB23t—28 to 36 inches, yellowish-brown (10YR 5/4) clay loam; common, medium, distinct, grayish-brown (10YR 5/2) mottles and common, medium, faint, yellowish-brown (10YR 5/6) mottles; weak, coarse, prismatic structure parting to moderate, medium, subangular blocky; firm; few roots; thin, very patchy, dark yellowish-brown (10YR 4/4) clay films on vertical ped faces; thin, patchy, pale-brown (10YR 6/3) silt coatings on vertical ped faces; many, medium, distinct, black (10YR 2/1) stains and concretions; 5 percent pebbles; medium acid; clear, wavy boundary.

IIB3—36 to 54 inches, yellowish-brown (10YR 5/4) clay loam; many, medium, distinct, yellowish-brown (10YR 5/8) mottles and common, fine, distinct, gray (10YR 6/1) mottles; weak, coarse, subangular blocky structure; friable to firm; common, fine, distinct, black (10YR 2/1) stains; 10 percent pebbles; slightly acid at 39 inches and neutral at 50 inches; clear, wavy boundary.

IIC—54 to 65 inches, yellowish-brown (10YR 5/6) and gray (10YR 5/1) loam; massive; firm, compact; common, fine, distinct, black (10YR 2/1) stains; 10 percent pebbles; mildly alkaline, calcareous.

The thickness of the solum and depth to calcareous glacial till is 42 to 60 inches. The mantle of loess is 22 to 40 inches thick. The A2, B1, and B2 horizons range from medium acid to strongly acid, and the B3 horizon is slightly acid to mildly alkaline. The Ap horizon is dark grayish brown (10YR 4/2) and brown (10YR 4/3 and 5/3). In undisturbed areas, the A1 horizon is very dark grayish brown (10YR 3/2) or very dark brown (10YR 2/2) 1 to 4 inches thick.

The A2 and B1 horizons are mainly yellowish brown (10YR

Formation and Classification of the Soils

In the following pages the factors of soil formation and the processes of soil formation in Highland County are discussed. The current system of soil classification is explained and the soil series placed in higher categories of the current classification system.

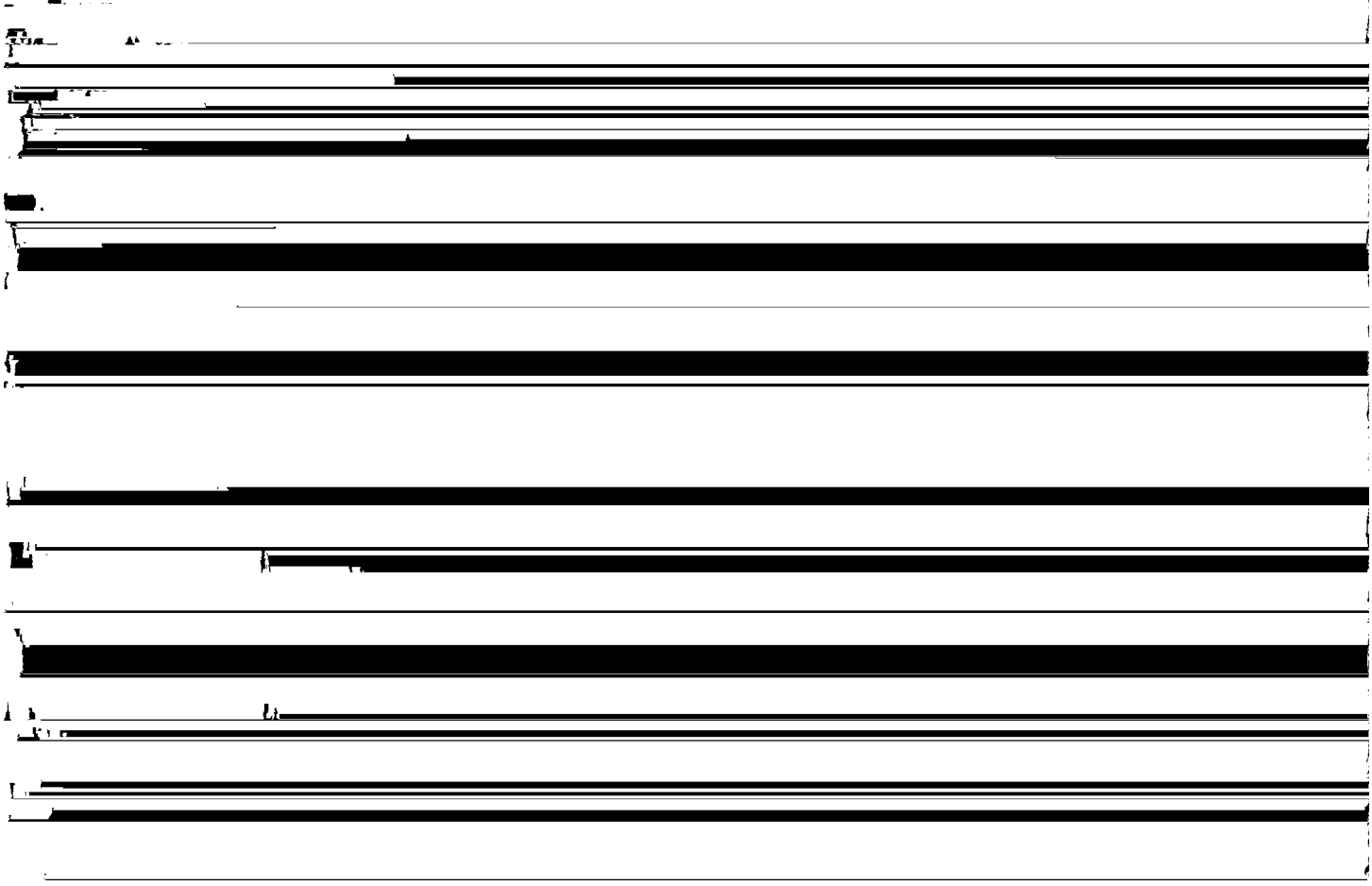
Factors of Soil Formation

Soils are the products of soil forming processes acting on materials deposited or accumulated by geologic forces. The important factors in soil formation are parent material, climate, relief, living organisms, and time.

Climate and living organisms, particularly vegetation, are the active forces in soil formation. Their effect on parent material is modified by relief and by the length of time the parent material has been acted upon. The relative importance of each factor differs from place to place. In places one factor may dominate and, in extreme cases, determine most of the soil properties, but normally the interaction of all five factors determines what kind of soil develops in any given place.

Parent material

The soils of Highland County formed in several kinds of parent material. These materials are glacial till, out-



but they formed in material derived from residuum weathered from calcareous shale rather than limestone. Beasley, Lawshe, and Guernsey soils formed in residuum or colluvium, or both. The residuum or colluvium, consists of calcareous shale or limestone. Colyer, Trappist, and other soils formed in the acid residuum weathered from shale, and Berks, Muskingum, Wellston, and other soils formed in the residuum weathered from sandstone.

Glacial drift is the most extensive parent material in this county, and in this survey, it includes outwash sand and gravel. Several of the soils formed in till, which was capped with loess up to 18 inches thick, on the end moraine in the extreme northeastern part of Highland County. Miamian, Celina, and Brookston soils are examples of those that formed in till and in less than 18 inches of loess. Soils that formed in till overlain by 18 to 40 inches of loess are Russell, Xenia, Fincastle, and other soils in the Wisconsin glaciated areas. Cincinnati, Rossmoyne, Avonburg, and Clermont soils are examples of those that formed in till, of Illinoian Age, over which was 18 to 40 inches of loess capping. In unglaciated areas the loess capping is mainly less than 18 inches thick but on Nicholson, Muse, and some other soils, it is more than 18 inches thick.

Outwash sand and gravel were deposited by glacial melt water that flowed in the many streams, or they occur in the form of glacial kames and eskers. Much of this coarse material was fairly well sorted, and then most of

greater depth has taken place. Carbonates have been leached to a depth of 2 to 3½ feet in Miamian and Celina soils, which formed in Wisconsin age till, but to a depth of 6 to 10 feet in Cincinnati and Rossmoyne soils, which formed in older Illinoian till. Frequency of rainfall has been favorable to the translocation of clay minerals and the development of soil structure. Examples are Brookston, Jessup, and Fox soils.

The range in temperature has favored both physical change and chemical weathering of parent material. Freezing and thawing has aided in the development of soil structure. Warm summer temperatures have favored chemical reactions in the weathering of primary minerals.

Both rainfall and temperature have been favorable to plant growth and the subsequent accumulation of organic matter in all the soils.

Relief

Because of the effect of relief, different soils may form in the same kind of parent material. A comparison of the Celina, Crosby, and Brookston soils, all of which formed in glacial till, shows how relief has affected their formation. Celina soils are well drained and have a moderately thick solum because they generally formed where the relief was not so steep that the soil material eroded away before soil could form and where relief was not so nearly level that water could not run off. The Crosby soils are

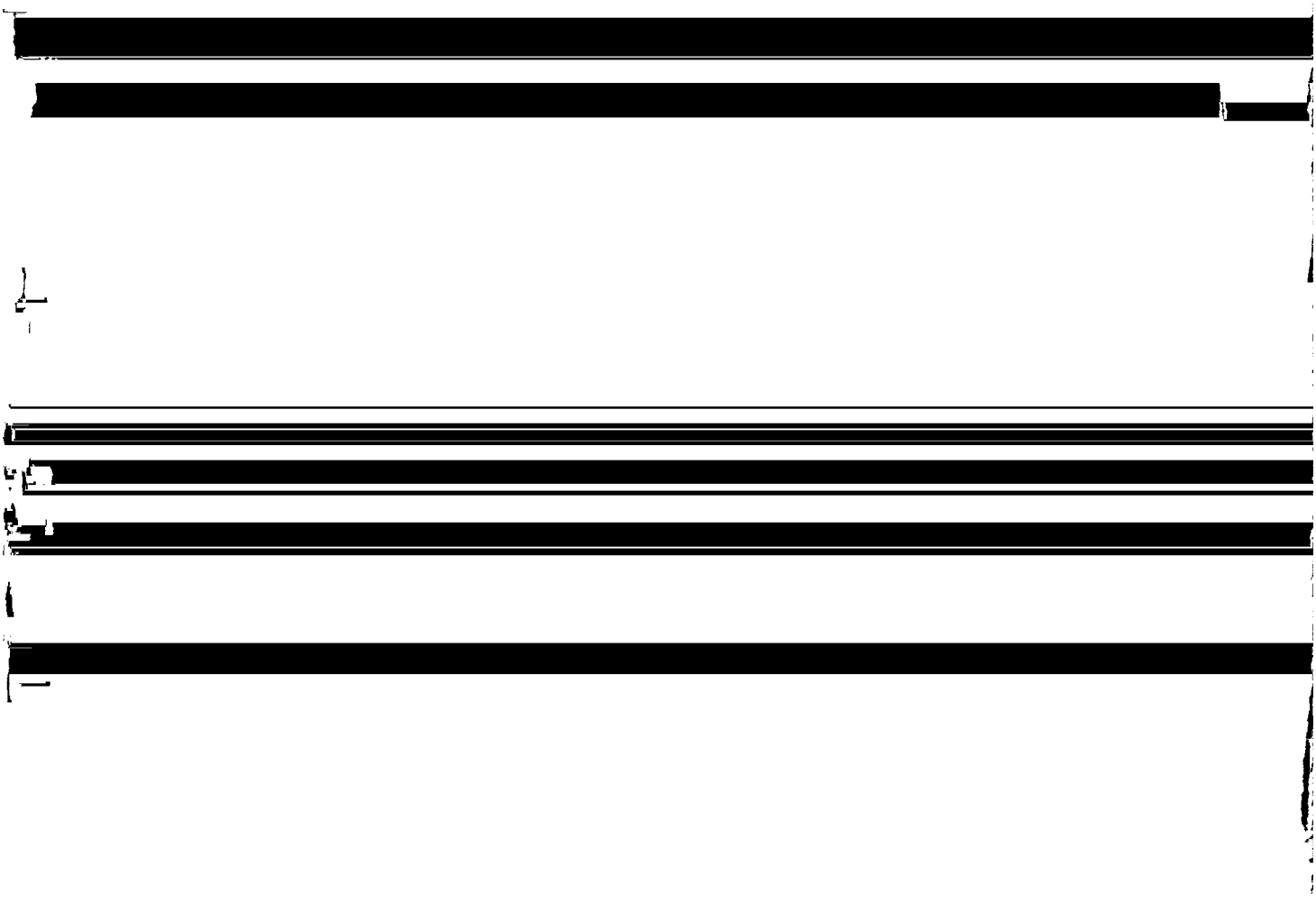
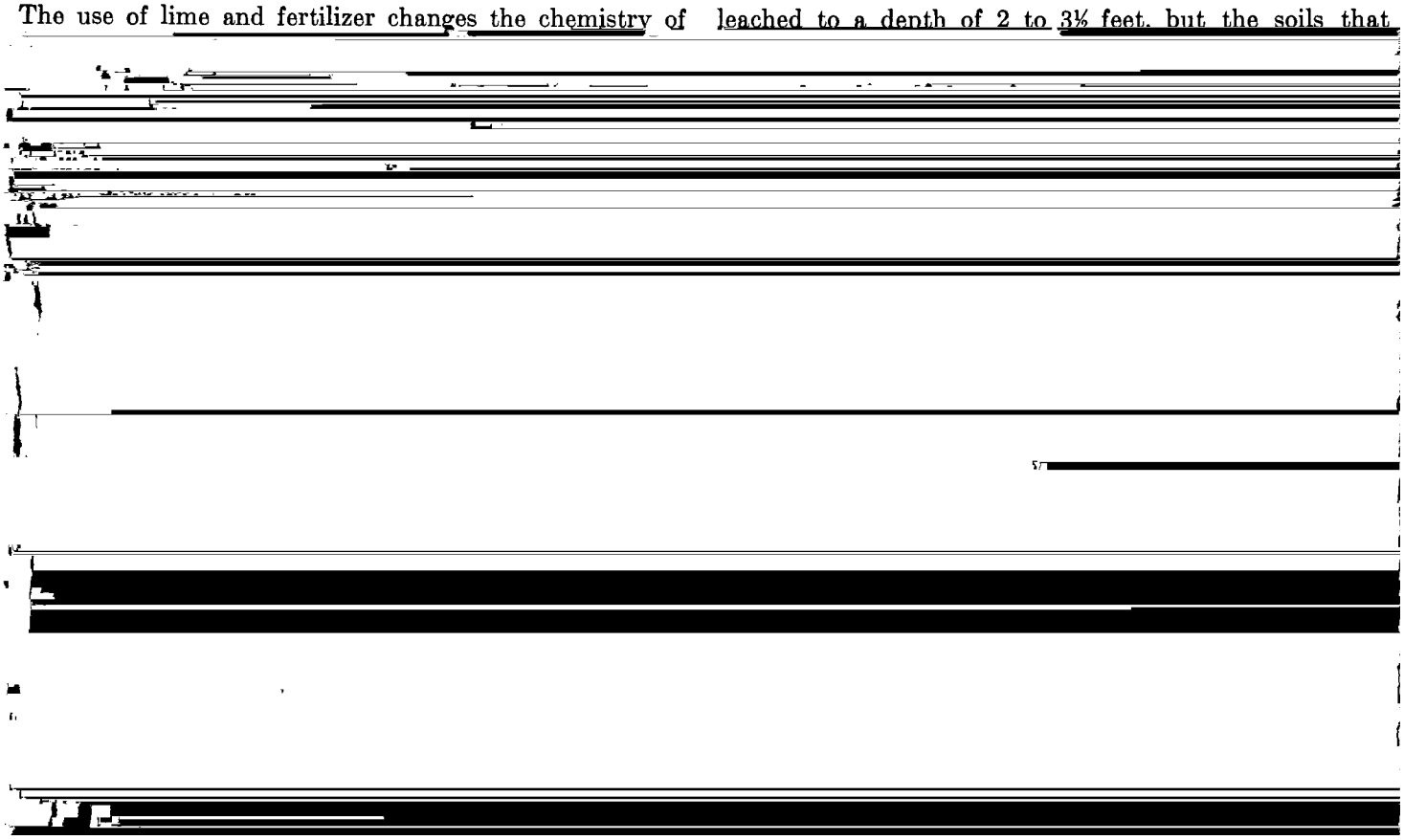


Figure 11.—**Area of Clermont silt loam where crawfish activity is evident.**

The use of lime and fertilizer changes the chemistry of leached to a depth of 2 to 3½ feet, but the soils that



On most soils some organic matter accumulates as a thin surface mat. This dark layer is generally obliterated by cultivation, but severe erosion may remove all evidence of this layer.

Under the current system of classification, six categories are recognized. Beginning with the broadest and the most inclusive, these are the order, the suborder, the great group, the subgroup, the family, and the series. In this system,

TABLE 9.—*Classification of the soils*

Series	Family	Subgroup	Order
Algiers [1]	Fine-loamy, mixed, nonacid, mesic	Aquic Udifluvents	Entisols.
Atlas	Fine, montmorillonitic, mesic, sloping	Aeric Ochraqualfs	Alfisols.
Avonburg	Fine-silty, mixed, mesic	Aeric Fragiaqualfs	Alfisols.
Beasley	Fine, mixed, mesic	Typic Hapludalfs	Alfisols.
Berks	Loamy-skeletal, mixed, mesic	Typic Dystrochrepts	Inceptisols.
Blanchester	Fine-silty, mixed, mesic	Typic Ochraqualfs	Alfisols.
Boston	Fine-silty, mixed, mesic	Typic Fraguidalfs	Alfisols.
Bratton	Fine, mixed, mesic	Typic Hapludalfs	Alfisols.
Brookston [1]	Fine-loamy, mixed, mesic	Typic Argiaquolls	Mollisols.
Cana	Fine-loamy, mixed, mesic	Aquic Hapludults	Ultisols.
Casco	Fine-loamy over sandy or sandy skeletal, mixed, mesic	Typic Hapludalfs	Alfisols.
Celina	Fine, mixed, mesic	Aquic Hapludalfs	Alfisols.
Cincinnati	Fine-silty, mixed, mesic	Typic Fragiudalfs	Alfisols.
Clermont	Fine-silty, mixed, mesic	Typic Ochraqualfs	Alfisols.
Colyer [1]	Clayey-skeletal, mixed, mesic	Lithic Dystrochrepts	Inceptisols.
Crosby	Fine, mixed, mesic	Aeric Ochraqualfs	Alfisols.
Dana	Fine-silty, mixed, mesic	Typic Argiudolls	Mollisols.
Dubois	Fine-silty, mixed, mesic	Aeric Fragiaqualfs	Alfisols.
Edenton	Fine, mixed, mesic	Typic Hapludalfs	Alfisols.
Eel	Fine-loamy, mixed, nonacid, mesic	Aquic Udifluvents	Entisols.
Fincastle	Fine-silty, mixed, mesic	Aeric Ochraqualfs	Alfisols.
Fitchville	Fine-silty, mixed, mesic	Aeric Ochraqualfs	Alfisols.

TABLE 9.—*Classification of the soils*—Continued

Series	Family	Subgroup	Order
Wellston	Fine-silty, mixed, mesic	Ultic Hapludalfs	Alfisols.
Westland	Fine-loamy, mixed, mesic	Typic Argiaquolls	Mollisols.
Williamsburg	Fine-loamy, mixed, mesic	Ultic Hapludalfs	Alfisols.
Xenia	Fine-silty, mixed, mesic	Aquic Hapludalfs	Alfisols.

[1] In Highland County, the following soils are taxadjuncts to the series for which they are named: Algiers soils are mottled at a depth of less than 20 inches, which is outside the range defined for the series. Brookston soils have more clay in the upper part of the B horizon than is defined as the range for the series. These taxadjuncts are classified in the fine, mixed, mesic family of Typic Argiaquolls. Colyer soils have less clay in the fine earth fraction of the profile than is defined as the range for the series. These taxadjuncts are classified in the loamy-skeletal, mixed, mesic family of Lithic Dystrochrepts. Hickory soils have a thinner solum and are shallower to carbonates than is

More than one-fourth of the farm income comes from the sale of crops. The acreage of principal crops harvested in 1969 was 46,071 of corn, 26,558 of soybeans, 18,543 of wheat, 22,865 of hay, and 471 of tobacco.

Geology

Although several factors have contributed to the formation of more than 75 different kinds of soil, the glaciation of nearly all of the county is one of the most significant. Two major glaciations covered a large part of the county. Only the southeastern part of Brush Creek and Jackson Townships have not been glaciated. The oldest glacial deposits in the county are of Illinoian age. Younger glacial deposits are associated with the early and late stages of the Wisconsin glaciation. The southernmost extent of the two Wisconsin stages are represented by the Cuba (early) and Reesville (late) end moraines. The Cuba end moraine has inner and outer segments and is north of the area glaciated in Illinoian time. This moraine extends from near New Vienna east through Samantha to north of Boston and Rainsboro and then to Rattlesnake Creek and the Ross County line. The Reesville end moraine is the most northerly and extends from the northwest part north of Leesburg [illegible] east through East Monroe and Greenfield to the

The thickest of these deposits are 18 to 40 inches thick and are on the nearly level glacial till plains of Illinoian age or "Crayfish Flats" area in the western part of the county.

The western parts of the county are underlain by bedrock of limestone and shale of Ordovician age. The hilly, unglaciated Allegheny Plateau area south of U.S. Route 50 in the extreme eastern part of the county is underlain by Devonian shale that is capped by Mississippian sandstone bedrock.

Geologic resources include deposits of sand and gravel suitable for construction purposes. Limestone bedrock is crushed and used in construction for agricultural limestone and cement; shale bedrock and heavy clay glacial till is used to produce agricultural drainage tile. One limestone formation in the county contains asphalt material that, when crushed, is particularly suited to highway construction and maintenance material.

Relief and Drainage

Highland County has a wide range in elevation that ranges from 720 feet along Middle Fork of Ohio Brush Creek at the Adams County line to 1,343 feet on Washburn Hill. This hill is in the Allegheny Plateau area west of the Pike County line. The county is drained by several

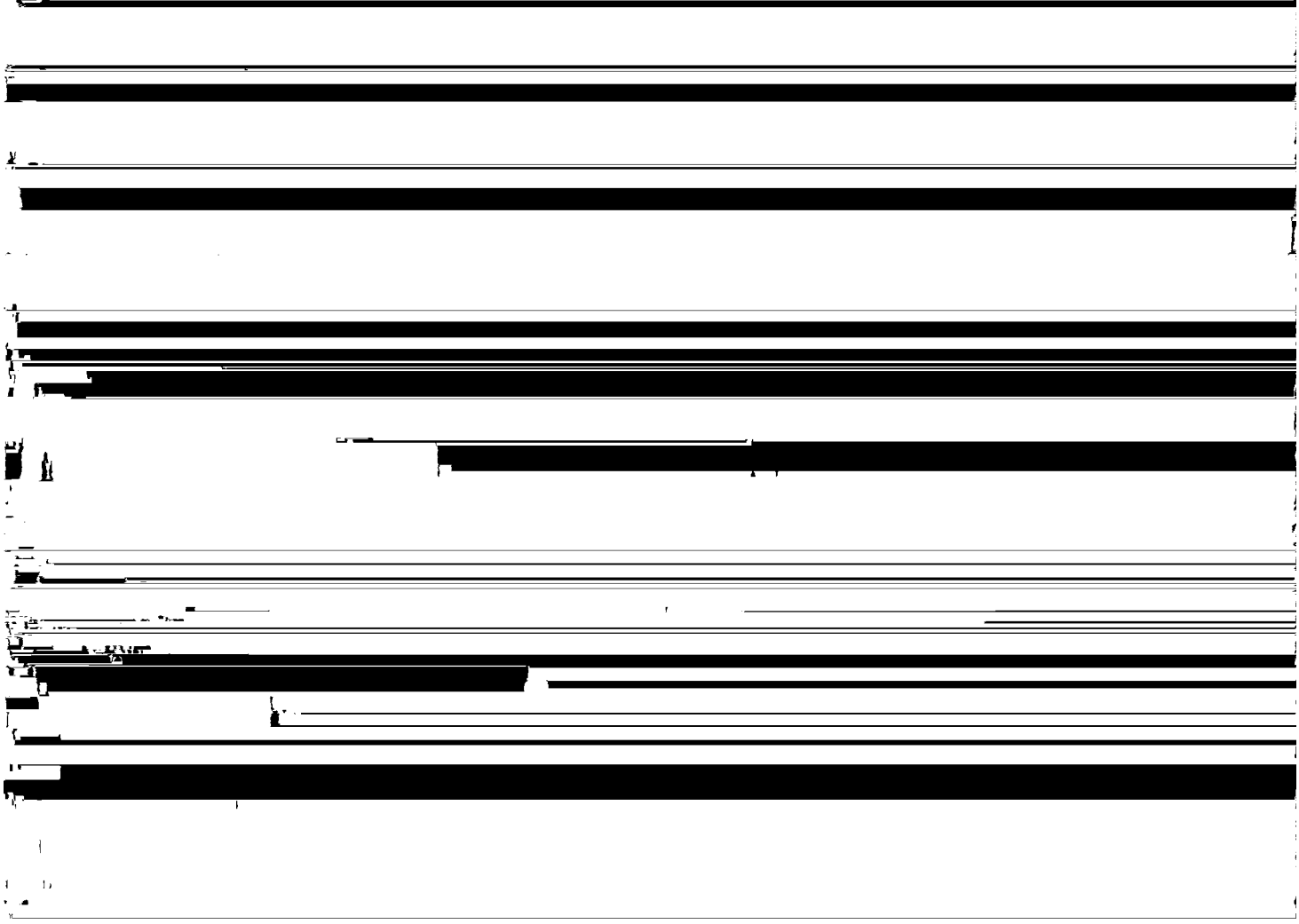


TABLE 10.—*Laboratory*

Soil and sample number	Horizon	Depth	Particle size distribution								
			Very coarse sand (2–1 mm)	Coarse sand (1–0.5 mm)	Medium sand (0.5–0.25 mm)	Fine sand (0.25–0.10 mm)	Very fine sand (0.10–0.05 mm)	Total sand (2.0–0.05 mm)	Silt (0.05–0.002 mm)	Clay (<0.002 mm)	Fine clay (<0.0002 mm)
		Inches	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*
Atlas silt loam (HY–48).	Ap	0–7	0.5	2.2	3.2	9.1	7.5	22.5	55.0	22.5	9.2
	B1t	7–12	.4	1.6	2.5	8.6	8.1	21.2	44.9	33.9	18.9
	IIB21t	12–17	.5	2.1	3.3	9.9	8.8	24.6	36.8	38.6	24.7
	IIB22t	17–24	.6	2.1	2.9	8.3	7.9	21.8	39.3	38.9	24.3
	IIB23tg	24–30	.4	1.5	2.0	5.7	5.9	15.5	41.7	42.8	25.3
	IIB24t	30–37	.3	1.1	1.5	4.5	5.0	12.4	41.1	46.5	24.1
	IIB24t	37–44	.3	.9	1.3	4.1	4.7	11.3	43.2	45.5	20.4
	IIB31	44–51	.3	1.2	1.8	5.1	5.9	14.3	45.2	40.5	17.1
	IIB32	51–67	1.7	5.2	4.1	9.0	8.0	28.0	41.2	30.8	13.5
	IIC1	67–77	1.6	4.1	3.8	10.0	8.9	28.4	42.8	28.8	11.4
	IIC2	77–90	3.0	5.6	4.5	10.7	9.2	33.0	43.7	23.3	6.8
Avonburg silt loam (HY–50).	Ap	0–9	1.4	3.3	3.2	8.2	7.2	23.3	63.8	12.9	3.5
	A2	9–15	.8	2.2	2.7	7.4	6.5	19.6	62.7	17.7	6.1
	B1	15–22	.6	2.0	2.3	6.2	5.6	16.7	62.0	21.3	8.1
	B21t	22–31	.5	1.6	2.0	4.8	6.1	15.0	60.1	24.9	10.6
	IIBx	31–39	.5	1.5	1.8	5.0	4.7	13.5	57.3	29.2	14.9
	IIB22t	39–47	.4	1.6	2.2	6.2	5.6	16.0	49.0	35.0	21.8
	IIB23t	47–55	.4	2.0	2.7	8.0	7.1	20.2	44.8	35.0	20.0
	IIB31	55–66	.5	2.0	2.9	8.2	8.4	22.0	42.9	35.1	20.8

data

Texture	Reaction	Organic-matter content	Calcium carbonate equivalent	Extractable cations				Sum of extractable cations	Sum of bases	Base saturation (sum)
				H	Ca	Mg	K			
	pH	*Percent*	*Percent*	*Meq per 100 grams of soil*	*Meq per 100 grams of soil*	*Meq per 100 grams of soil*	*Meq per 100 grams of soil*	*Meq per 100 grams of soil*	*Meq per 100 grams of soil*	*Percent*
Silt loam	5.2	1.4		8.8	6.1	1.5	0.20	16.6	7.8	47
Clay loam	4.6	1.4		16.4	3.4	2.6	.26	22.7	6.3	28
Clay loam	4.5	.2		18.0	3.5	4.0	.28	25.8	7.8	30
Clay loam	4.5	.3		17.1	4.0	5.3	.28	26.8	9.6	36
Silty clay	4.6	.2		17.4	5.1	6.9	.32	29.7	12.3	41
Silty clay	4.6	.3		17.0	6.5	7.6	.31	31.4	14.4	46
Silty clay	4.6	.2		13.1	7.0	8.4	.28	28.8	15.7	54
Silty clay	5.2	.2		4.4	8.8	9.7	.26	23.2	18.8	81
Clay loam	6.6			4.2	9.3	8.3	.22	22.0	17.8	81
Clay loam	7.5		5.7							
Loam	7.9		17.2							
Silt loam	6.1	2.7		5.4	5.2	1.4	.33	12.3	6.9	56
Silt loam	4.8	.7		7.7	1.9	.7	.15	10.4	2.7	26
Silt loam	4.6	.3		11.1	.9	.6	.13	12.7	1.6	13
Silt loam	4.5	.3		13.5	.8	1.2	.18	15.7	2.2	14
Silty clay loam	4.5	.3		15.7	1.5	2.2	.20	19.6	3.9	20
Silty clay loam	4.5	.3		18.9	2.5	3.3	.22	24.9	6.0	24
Clay loam	4.4	.2		14.4	4.5	5.5	.24	24.6	10.2	42
Clay loam	4.6	.2		12.0	6.6	7.2	.23	26.0	14.0	54
Clay loam	5.8	.2		6.1	12.0	10.5	.22	28.8	22.7	79
Clay loam	6.8	.2		3.7	19.3	10.1	.21	33.3	29.6	89
Loam	7.9									
Silt loam	6.5	2.9		4.6	10.1	4.3	.20	19.2	14.6	76
Silt loam	6.3	2.9		4.9	10.0	3.9	.20	19.0	14.1	74
Silty clay loam	5.6	1.9		7.4	11.6	5.5	.20	24.7	17.3	70
Silty clay loam	5.6	.9		5.9	11.3	6.0	.20	23.4	17.5	75
Silty clay loam	5.8			5.9	12.0	6.9	.30	25.1	19.2	76
Silty clay loam	6.1			4.4	13.1	7.4	.26	25.2	20.8	83
Silty clay loam	6.4			3.9	14.7	8.7	.40	27.7	23.8	86
Silty clay loam	6.7			2.9	14.0	6.6	.40	23.9	21.0	88
Clay loam	7.4		.3							
Silty clay loam	7.3		.4							
Silt loam	7.0	1.8		3.3	6.8	1.5	.20	11.8	8.5	72
Silt loam	6.0	.7		6.1	5.9	2.0	.21	14.2	8.1	57
Silty clay loam	5.1	.5		8.6	5.0	3.3	.22	17.1	8.5	50
Silty clay loam	5.3	.3		7.2	5.6	5.1	.26	18.2	11.0	60
Silty clay loam	6.1	.3		5.1	7.6	8.0	.25	21.0	15.9	76
Clay	6.9			6.3	18.1	13.6	.31	38.3	32.0	84
Clay	7.4		2.3							
Sandy clay loam	7.8		72.1							
Silt loam	5.3	2.0		[1] ND	1.8	.6	.27	ND	2.7	ND
Silt loam	5.4	.8		6.7	3.8	1.2	.20	11.9	5.2	44
Silty clay loam	5.5	.7		7.0	5.0	2.0	.27	14.3	7.3	51
Silty clay loam	5.5	.5		6.8	6.2	3.7	.22	16.9	10.1	60
Loam	5.3	.3		6.7	4.5	2.6	.19	14.0	7.3	52
Clay loam	5.3	.3		7.7	5.1	3.3	.20	16.3	8.6	53
Clay loam	5.4	.3		6.5	7.1	2.8	.20	16.6	10.1	61
Clay loam	5.4	.3		5.9	12.0	6.5	.23	24.6	18.7	76
Clay loam	6.2	.3		4.2	11.9	4.0	.17	20.3	16.1	79
Clay loam	6.2	.3		3.2	11.4	4.8	.21	19.6	16.4	84
Loam	7.8	.3	33.1							

TABLE 10.—*Laboratory*

Soil and sample number	Horizon	Depth	Particle size distribution								
			Very coarse sand (2–1 mm)	Coarse sand (1–0.5 mm)	Medium sand (0.5–0.25 mm)	Fine sand (0.25–0.10 mm)	Very fine sand (0.10–0.05 mm)	Total sand (2.0–0.05 mm)	Silt (0.05–0.002 mm)	Clay (<0.002 mm)	Fine clay (<0.0002 mm)
		Inches	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*
Clermont silt loam (HY–49).	Ap	0–7	.8	2.6	2.2	4.7	4.1	14.4	67.6	18.0	4.8
	A2	7–13	.8	2.0	1.9	3.9	4.0	12.6	65.0	22.4	7.7
	A&B	13–17	.6	1.7	1.5	3.5	3.3	10.6	60.9	28.5	12.8
	B&A	17–25	.4	1.2	1.3	3.0	3.2	9.1	58.6	32.3	16.2
	B21tg	25–37	.5	1.4	1.5	3.5	3.2	10.1	56.7	33.2	19.2
	IIB22tg	37–43	.7	2.7	2.3	4.6	3.9	14.2	45.9	39.9	22.6
	IIB23tg	43–50	.5	1.9	2.3	5.3	4.5	14.5	41.0	44.5	28.0
	IIB24t	50–62	.6	1.7	2.3	6.0	5.4	16.0	39.1	44.9	35.6
	IIB31	62–78	.8	2.4	2.6	6.5	6.5	18.8	38.7	42.5	22.9
	IIB32	78–94	.7	2.7	3.3	9.0	7.9	23.6	42.4	34.0	16.7
	IIC1	94–100	3.7	5.0	4.1	8.1	7.6	28.5	37.4	34.1	17.7
	IIC2	100–116	4.9	7.4	6.3	12.9	11.6	43.1	40.6	16.3	6.1
Fitchville silt loam (HY–61).	Ap	0–10	1.3	1.9	1.3	2.2	3.2	9.9	74.3	15.8	3.4
	A2	10–15	1.3	2.2	1.4	2.1	3.2	10.2	69.1	20.7	7.4
	B1t	15–22	.7	1.2	.8	1.6	3.3	7.6	65.6	26.8	12.4
	B21t	22–29	.4	.7	.5	1.4	2.7	5.7	66.4	27.9	13.7
	B22t	29–37	1.7	3.6	2.2	3.3	3.4	14.2	58.9	26.9	12.2
	B23t	37–47	2.1	5.2	2.8	4.1	4.1	18.3	52.2	29.5	17.3
	IIB31t	47–57	2.0	4.8	3.8	7.2	5.7	23.5	47.0	29.5	18.2
	IIB32	57–68	10.7	16.1	8.3	6.2	3.8	45.1	26.8	28.1	18.0
	IIB33	68–77	5.2	15.1	9.0	8.1	5.0	42.4	28.1	29.5	20.5
	IIC1	77–90	3.5	11.5	5.0	8.5	10.4	38.9	45.8	15.3	10.3
	IIC2	90–106									
Haubstadt silt loam (HY–53).	Ap	0–6	.7	2.8	3.6	7.0	4.0	18.1	66.7	15.2	3.6
	B1	6–10	.8	2.3	3.2	6.1	3.4	15.8	65.2	19.0	5.9
	B2t	10–18	2.7	4.6	6.1	12.4	6.9	32.7	47.2	20.1	8.0
	IIBx1	18–28	2.5	5.3	7.8	17.5	10.6	43.7	39.9	16.4	7.4
	IIBx2	28–37	2.1	4.7	6.8	15.5	9.9	39.0	39.8	21.2	9.4
	IIBx3	37–45	2.2	5.2	7.0	15.1	9.5	39.0	37.5	23.5	11.6
	IIBx3	45–53	2.6	5.0	6.8	15.1	9.5	39.0	35.4	25.6	12.8
	IIB31t	53–59	2.0	4.8	6.7	14.1	9.2	37.1	35.7	27.2	14.2
	IIB32t	59–73	5.6	6.3	6.0	12.4	8.0	38.3	31.6	30.1	16.5
	IIC1	73–110	3.5	6.2	5.7	11.5	7.8	34.7	35.8	29.5	13.6
Loudon silt loam (HY–62).	Ap	0–8	1.3	2.9	2.4	5.4	3.5	15.5	67.9	16.6	3.5
	B1	8–12	2.0	2.9	2.1	4.2	2.9	14.1	62.7	23.2	6.8
	B21t	12–19	1.2	1.8	1.3	2.9	2.1	9.3	61.4	29.3	11.5
	IIB22t	19–26	.8	1.1	.8	2.2	1.7	6.6	56.7	36.7	18.9
	IIB23t	26–38	.5	1.3	1.6	4.3	2.9	10.6	43.6	45.8	29.4
	IIIB31	38–45	.1	.3	.2	.7	1.3	2.6	43.7	53.7	21.6
	IIIB32	45–58	.8	.4	.2	.2	1.2	2.8	55.0	42.2	13.2
	IIIC1	58–70	.2	.2	.1	.2	.8	1.5	62.0	36.5	9.1
	IIIC2	70–81	.5	.3	.1	.3	1.7	2.9	66.6	30.5	6.7
	IIIR	81–100	.9	.6	.3	.6	2.2	4.6	67.6	27.8	5.6
Negley loam (HY–64).	Ap	0–5	5.1	11.0	7.6	7.9	3.9	35.5	45.5	19.0	7.9
	Ap	5–8	7.2	9.7	6.3	6.9	3.9	34.0	47.3	18.7	7.8
	B1	8–14	10.7	13.4	8.6	9.3	5.1	47.1	36.6	16.3	7.2
	B21t	14–24	9.8	14.8	9.7	9.8	5.2	49.3	32.1	18.6	7.0
	B22t	24–33	10.0	15.9	7.5	7.1	4.1	44.6	23.1	32.3	13.9
	B23t	33–42	11.9	23.6	7.9	4.7	2.4	50.5	16.6	32.9	12.2
	B24t	42–57	10.3	25.7	9.3	5.2	2.4	52.9	13.4	33.7	13.3
	B25t	57–72	10.3	20.7	8.3	5.2	2.3	47.8	16.5	35.7	17.7
	B31t	72–92	6.0	26.5	16.3	8.5	2.6	59.9	12.1	28.0	13.8
	B32	92–108	13.5	30.0	16.8	9.9	1.9	72.1	10.7	17.2	8.1
	B33	108–126	12.0	35.9	16.0	9.1	1.5	74.5	10.8	14.7	7.1
	C	126–156	12.0	43.5	19.6	7.6	1.5	84.2	10.9	4.9	2.0

See footnote at end of table.

data—Continued

Texture	Reaction	Organic-matter content	Calcium carbonate equivalent	Extractable cations				Sum of extractable cations	Sum of bases	Base saturation (sum)
				H	Ca	Mg	K			
	pH	*Percent*	*Percent*	*Meq per 100 grams of soil*	*Meq per 100 grams of soil*	*Meq per 100 grams of soil*	*Meq per 100 grams of soil*	*Meq per 100 grams of soil*	*Meq per 100 grams of soil*	*Percent*
Silt loam	6.2	1.7		3.6	6.2	2.1	.18	12.1	8.5	70
Silt loam	5.1	.7		6.4	3.7	2.1	.18	12.4	6.0	48
Silty clay loam	4.8	.3		9.5	2.9	1.9	.20	14.5	5.0	34
Silty clay loam	4.8	.3		10.5	3.3	3.6	.26	17.7	7.2	41
Silty clay loam	4.8	.3		12.3	3.9	4.4	.29	20.9	8.6	41
Silty clay loam	4.7	.5		16.6	6.4	6.6	.36	30.0	13.4	45
Silty clay	4.8	.5		15.8	7.7	8.6	.38	32.5	16.7	51
Clay	4.9	.5		16.8	8.4	8.9	.31	34.4	17.6	51
Clay	6.0	.3		8.0	13.3	12.3	.31	33.9	25.9	76
Clay loam	7.0	.1		2.1	10.5	8.6	.26	21.5	19.4	90
Clay loam	7.1	.3		4.7	12.3	8.9	.26	26.2	21.5	82
Loam	7.7		27.8							
Silt loam	7.0	2.0		4.1	6.5	2.3	.17	13.1	9.0	69
Silt loam	6.8	.7		4.1	5.1	1.8	.12	11.1	7.0	63
Silt loam	5.4	.5		8.6	5.1	2.6	.20	16.5	7.9	48
Silty clay loam	5.1	.5		11.9	3.7	2.2	.25	18.0	6.1	34
Silt loam	5.2	.3		10.2	5.0	3.9	.20	19.3	9.1	47
Silty clay loam	5.7	.3		6.5	7.0	6.0	.29	19.8	13.3	67
Clay loam	6.4	.3		4.5	10.3	8.7	.31	23.8	19.3	81
Sandy clay loam	6.8			5.3	7.9	3.1	.26	16.6	11.3	68
Clay loam	7.1			4.0	12.0	7.7	.36	24.1	20.1	83
Loam	7.7		55.5							
	7.8		26.7							
Silt loam	5.0	1.7		7.1	2.1	.5	.31	10.0	2.9	29
Silt loam	5.1	.5		6.3	2.6	.6	.08	9.6	3.3	34
Loam	4.8	.3		8.8	2.2	.8	.10	11.9	3.1	26
Loam	4.7	.2		6.5	1.1	.9	.23	8.7	2.2	26
Loam	4.8	.2		5.7	1.8	1.8	.26	9.6	3.9	40
Loam	4.8	.2		8.7	3.7	3.4	.31	16.1	7.4	46
Loam	4.8	.2		8.5	2.8	2.3	.28	13.9	5.4	39
Clay loam	4.9	.2		7.2	4.8	4.5	.19	16.7	9.5	57
Clay loam	5.5	.2		5.9	4.9	3.7	.31	14.8	8.9	60
Clay loam	6.8	.3		2.5	7.6	5.5	.31	15.9	13.4	84
Silt loam	5.8	2.9		9.1	3.1	1.0	.40	13.6	4.5	33
Silt loam	5.3	1.0		9.1	2.2	1.4	.43	13.1	4.0	31
Silty clay loam	5.0	.7		12.2	2.0	1.8	.37	16.4	4.2	25
Silty clay loam	4.9	.5		14.4	3.2	5.0	.33	22.9	8.5	38
Silty clay	5.3	.5		11.9	5.3	9.5	.44	27.1	15.2	56
Silty clay	7.8		14.0							
Silty clay	8.0		30.4							
Silty clay loam	8.0		22.4							
Silty clay loam	8.1		29.8							
Silty clay loam	8.0		29.5							
Loam	6.9	1.4		3.6	5.0	1.7	.27	10.6	7.0	66
Loam	6.6	1.0		3.7	3.9	1.5	.17	9.3	5.6	60
Loam	5.4	.3		4.4	2.2	1.3	.12	8.0	3.6	45
Loam	5.2	.3		5.9	2.0	1.3	.18	9.4	3.5	37
Clay loam	5.4	.3		7.8	3.6	2.1	.26	13.8	6.0	43
Sandy clay loam	5.4	.3		8.0	3.1	2.8	.27	14.2	6.2	44
Sandy clay loam	5.2	.3		8.7	2.8	2.7	.22	14.4	5.7	40
Sandy clay	5.2	.3		10.5	3.7	2.9	.25	17.3	6.8	39
Sandy clay loam	5.3	.3		7.9	3.1	2.6	.23	13.8	5.9	43
Coarse sandy loam	5.7	.3		4.6	3.2	2.4	.16	10.4	5.8	56
Coarse sandy loam	6.4	.3		3.3	5.6	2.8	.15	11.8	8.5	72
Loamy coarse sand	7.7	.5	40.6							

TABLE 10.—*Laboratory*

Soil and sample number	Horizon	Depth	Particle size distribution								
			Very coarse sand (2–1 mm)	Coarse sand (1–0.5 mm)	Medium sand (0.5–0.25 mm)	Fine sand (0.25–0.10 mm)	Very fine sand (0.10–0.05 mm)	Total sand (2.0–0.05 mm)	Silt (0.05–0.002 mm)	Clay (<0.002 mm)	Fine clay (<0.0002 mm)
		Inches	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*
Nicholson silt loam (HY–59).	Ap	0–8	.7	1.6	.9	1.3	1.2	5.7	77.7	16.6	3.4
	B1	8–14	1.2	1.5	.6	.6	.9	4.8	69.8	25.4	10.0
	B2t	14–24	1.7	2.0	.7	.7	.9	6.0	67.3	26.7	13.3
	Bx1	24–34	5.3	3.6	1.2	1.2	1.4	12.7	66.3	21.0	8.7
	IIBx2	34–42	4.4	2.8	1.0	1.2	1.4	10.8	54.2	35.0	14.7
	IIB31	42–50	1.0	1.4	.7	1.1	1.2	5.4	37.9	56.7	30.5
	IIB32	50–67	1.6	1.9	1.0	1.4	1.7	7.6	34.7	57.7	31.5
	IIB33	67–74	.4	.7	.5	1.3	4.7	7.6	46.3	46.1	23.1
Ockley silt loam (HY–66).	Ap	0–6	.7	1.7	1.8	6.4	9.0	19.6	67.1	13.3	3.3
	B&A	6–9	.3	1.1	1.3	5.1	7.7	15.6	65.3	19.1	7.3
	B1t	9–14	.2	.7	1.1	4.7	7.4	14.1	57.7	28.2	14.3
	B21t	14–21	.4	.8	1.3	6.2	7.9	16.6	52.8	30.6	17.3
	IIB22t	21–27	.8	1.5	2.3	10.8	9.8	25.2	48.2	26.6	13.7
	IIB23t	27–33	3.1	4.9	5.3	21.0	10.2	44.5	33.8	21.7	10.7
	IIB24t	33–42	19.7	12.5	4.8	9.0	3.7	49.6	26.7	23.7	11.4
	IIB32	42–52	.3	.3	.2	.6	6.9	8.3	63.1	28.6	10.7
	IIB33	52–58	.3	.4	.2	.7	9.4	11.1	62.4	26.5	10.8
	IIC	58–70	39.6	31.4	4.4	1.5	.8	77.7	6.2	16.1	9.0
Opequon silt loam (HY–54).	Ap	0–5	.1	.6	.5	1.0	1.0	3.2	73.6	23.2	8.1
	IIB21t	5–8	.2	.2	.2	.5	.8	1.9	58.7	39.8	23.2
	IIB22t	8–15	.3	.4	.3	1.0	.8	2.8	32.4	64.8	43.4
	IIC	15–19	1.9	3.6	4.5	32.7	18.8	61.5	19.6	18.9	12.1
Rossmoyne silt loam (HY–51).	Ap	0–8	.8	2.6	2.1	4.1	3.0	12.6	70.6	16.8	3.8
	A2	8–12	.5	1.6	1.5	2.7	3.1	9.4	67.4	23.2	8.1
	B1	12–17	.2	1.3	1.5	3.2	3.1	9.3	64.3	26.4	11.9
	B2t	17–23	.5	1.7	2.3	5.3	4.5	14.3	54.0	31.7	18.1
	IIBx1	23–30	1.0	2.5	3.1	7.7	6.8	21.1	47.3	31.6	18.0

data—Continued

Texture	Reaction	Organic-matter content	Calcium carbonate equivalent	Extractable cations				Sum of extractable cations	Sum of bases	Base saturation (sum)
				H	Ca	Mg	K			
	pH	*Percent*	*Percent*	*Meq per 100 grams of soil*	*Meq per 100 grams of soil*	*Meq per 100 grams of soil*	*Meq per 100 grams of soil*	*Meq per 100 grams of soil*	*Meq per 100 grams of soil*	*Percent*
Silt loam	5.5	2.0		8.0	3.7	.8	.15	12.6	4.6	37
Silt loam	5.8	.7		7.7	6.4	2.0	.18	16.3	8.6	53
Silt loam	5.3	.3		9.3	4.7	2.6	.19	16.8	7.5	45
Silt loam	5.3	.3		7.9	3.6	2.3	.14	13.9	6.0	43
Silty clay loam	6.3	.3		4.4	7.9	5.1	.20	17.6	13.2	75
Clay	6.9	.7		4.0	16.9	4.8	.20	25.9	21.9	85
Clay	7.2	1.0		5.1	13.9	7.8	.23	27.0	21.9	81
Silty clay	7.5		.7							
Silt loam	5.9	1.5		6.4	3.9	1.1	.54	11.9	5.5	46
Silt loam	5.6	1.0		6.8	4.5	1.7	.39	13.4	6.6	49
Silty clay loam	5.5	.5		7.4	6.3	2.7	.33	16.7	9.3	56
Silty clay loam	5.2	.5		8.8	6.6	2.9	.31	18.6	9.8	53
Loam	5.2	.5		9.6	5.5	2.7	.30	18.1	8.5	47
Loam	5.5	.5		6.8	5.0	2.7	.23	14.7	7.9	54
Loam	5.3	.7		7.2	4.5	2.8	.31	14.8	7.6	51
Silty clay loam	7.4		19.4							
Silt loam	7.7		13.1							
Coarse sandy loam	7.4		.3							
Silt loam	6.8	2.4		4.2	8.5	4.0	.43	17.1	12.9	75
Silty clay loam	6.8	1.2		6.5	10.9	6.7	.56	24.7	18.2	74
Clay	6.6	2.2		9.7	18.7	14.6	.77	43.8	34.1	78
Fine sandy loam	7.6		81.0							
Silt loam	5.8	1.7		7.6	4.4	.5	.22	12.7	5.1	40
Silt loam	5.0	.7		10.5	3.1	.8	.20	14.6	4.1	28
Silt loam	4.7	.5		10.8	2.9	1.5	.26	15.5	4.7	30
Silty clay loam	4.7	.5		14.1	4.8	3.1	.31	22.3	8.2	37
Clay loam	4.7	.1		11.6	5.1	3.5	.29	20.5	8.9	43
Clay loam	4.8	.1		9.0	4.9	4.6	.20	18.7	9.7	52
Loam	5.8	.1		4.5	7.4	5.8	.18	17.9	13.4	75
Loam	6.5	.1		3.3	7.1	4.9	.15	15.4	12.1	79
Clay loam	7.0	.1		4.3	14.4	9.2	.20	28.1	23.8	85
Clay loam	7.3		1.1							
Loam	7.9		20.6							
Silt loam	7.3	2.4		ND	5.2	1.5	.48		7.2	ND
Silt loam	7.0	1.2		3.7	4.6	1.4	.29	10.0	6.3	63
Silt loam	6.3	.5		5.6	4.5	1.6	.24	11.9	6.3	53
Silty clay loam	5.2	.7		9.6	5.0	1.8	.27	16.7	7.1	42
Silt loam	5.6	.3		7.9	6.8	2.4	.21	17.3	9.4	54
Loam	6.2	.5		4.7	6.5	2.8	.22	14.2	9.5	67
Loam	7.9		12.7							
Loam	7.7		8.2							
Silt loam	6.1	2.2		5.3	6.4	2.2	.14	14.0	8.7	62
Silty clay loam	6.5	.7		5.1	9.7	4.1	.21	19.1	14.0	72
Silty clay loam	6.1	.7		6.0	7.9	3.5	.24	17.6	11.6	66
Silt loam	5.1	.3		10.5	6.0	3.9	.19	20.6	10.1	49
Silt loam	5.3	.5		7.4	8.0	5.4	.23	21.0	13.6	65
Silt loam	6.3	.3		3.5	8.9	5.9	.18	18.5	15.0	81
Loam	6.6	.3		2.3	7.8	5.8	.18	15.1	12.8	85
Loam	6.6	.1		2.6	8.2	5.0	.18	16.0	13.4	84
Sandy clay loam	7.1			2.6	10.2	4.4	.19	17.4	14.8	85

TABLE 10.—*Laboratory*

Soil and sample number	Horizon	Depth	Particle size distribution								
			Very coarse sand (2–1 mm)	Coarse sand (1–0.5 mm)	Medium sand (0.5–0.25 mm)	Fine sand (0.25–0.10 mm)	Very fine sand (0.10–0.05 mm)	Total sand (2.0–0.05 mm)	Silt (0.05–0.002 mm)	Clay (<0.002 mm)	Fine clay (<0.0002 mm)
		Inches	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*
Williamsburg silt loam (HY–65).	Ap	0–9	.7	2.0	2.3	3.5	1.9	10.4	73.2	16.4	3.4
	A2	9–12	.9	1.4	1.5	2.5	1.4	7.7	69.4	22.9	9.0
	B1	12–17	.4	1.1	1.3	2.5	1.4	6.7	66.8	26.5	13.5
	B21t	17–23	.6	1.5	2.0	4.0	2.2	10.3	60.2	29.5	16.4

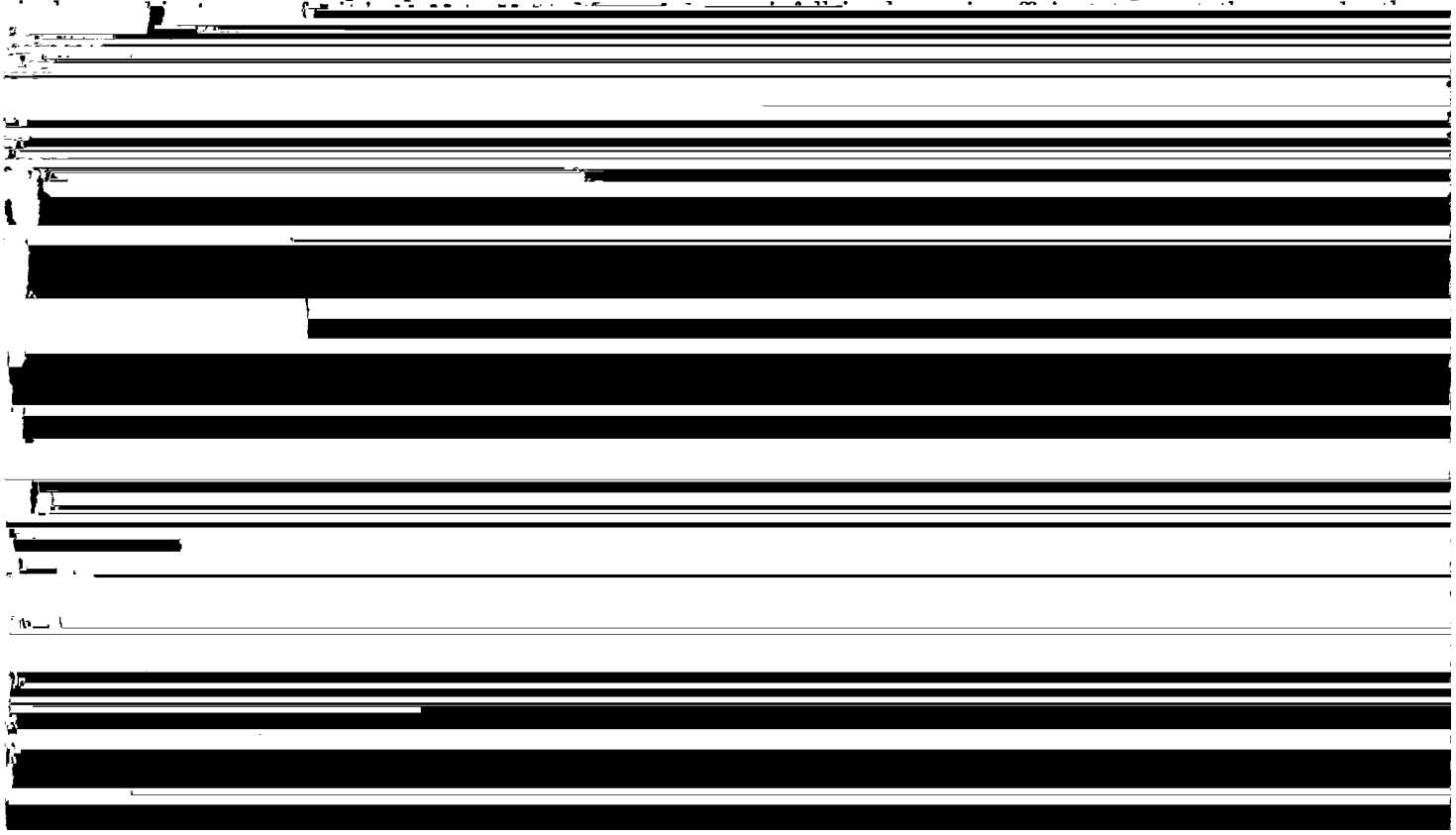
data—Continued

Texture	Reaction	Organic-matter content	Calcium carbonate equivalent	Extractable cations				Sum of extractable cations	Sum of bases	Base saturation (sum)
				H	Ca	Mg	K			
	pH	*Percent*	*Percent*	*Meq per 100 grams of soil*	*Meq per 100 grams of soil*	*Meq per 100 grams of soil*	*Meq per 100 grams of soil*	*Meq per 100 grams of soil*	*Meq per 100 grams of soil*	*Percent*
Silt loam	5. 2	2. 2	----------	10. 3	2. 3	. 5	. 18	13. 3	3. 0	22
Silt loam	5. 4	. 8	----------	7. 7	3. 8	. 9	. 14	12. 5	4. 8	39
Silt loam	5. 3	. 5	----------	8. 2	4. 6	1. 1	. 21	14. 1	5. 9	42
Silty clay loam	5. 0	. 3	----------	10. 6	4. 4	1. 5	. 30	16. 8	6. 2	37
Loam	4. 9	. 3	----------	10. 4	3. 1	1. 9	. 30	15. 7	5. 3	34
Sandy clay loam	5. 1	. 5	----------	11. 4	4. 3	2. 6	. 35	18. 6	7. 2	39
Sandy clay loam	5. 2	. 5	----------	8. 6	4. 1	2. 5	. 28	15. 5	6. 9	44
Coarse sandy loam	5. 6	. 5	----------	4. 8	3. 2	. 7	. 14	8. 8	4. 0	46
Sandy clay loam	6. 0	. 8	----------	7. 1	7. 2	3. 1	. 24	17. 6	10. 5	60
Fine sandy loam	6. 2	. 5	----------	4. 3	5. 0	2. 1	. 20	11. 6	7. 3	63
Loam	6. 6	. 5	----------	4. 8	7. 6	2. 6	. 21	15. 2	10. 4	68
Loam	7. 7	----------	16. 0	----------	----------	----------	----------	----------	----------	----------

less than 2° in 9 of 10 years, 6° below zero in 5 of 10 years, and 16° below zero in 1 of 10 years.

Precipitation in Highland County varies widely from year to year. It is normally abundant and well distributed throughout the year, and fall is the driest season. In 1 year out of 5, the annual precipitation is 40.17 to 44.01

Soil moisture goes through a seasonal cycle each year that is almost independent of the amount of precipitation received. It reaches its lowest point in October and is replenished during winter and spring, when precipitation exceeds water loss by evaporation. In July and August when the water needs of all crops reach a maximum and



percent at 1 a.m. and 7 a.m., 55 percent at 1 p.m. and 70 percent at 7 p.m. Cloudiness is greatest in winter and least in summer. This seasonal variation in cloudiness is most clearly illustrated by the percentage of possible sunshine that is about 70 percent in July and 35 percent in December.

Since 1900, six tornadoes have been reported in Highland County.

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Very low	Less than 2.4 inches
Low	2.4 to 3.2 inches
Medium	3.2 to 5.2 inches
High	More than 5.2 inches

Calcareous soil. A soil containing enough calcium carbonate (often with magnesium carbonate) to effervesce (fizz) visibly when treated with cold, dilute hydrochloric acid.

Clay. As a soil separate, the mineral soil particles less than 0.002 millimeter in diameter. As a soil textural class, soil material that is 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.

Clay film. A thin coating of clay on the surface of a soil aggregate. Synonyms: clay coat, clay skin.

Colluvium. Soil material, rock fragments, or both, moved by creep, slide, or local wash and deposited at the base of steep slopes.

Concretions. Grains, pellets, or nodules of various sizes, shapes, and colors consisting of concentrations of compounds, or of soil grains cemented together. The composition of some concretions is unlike that of the surrounding soil. Calcium carbonate and iron oxide are examples of material commonly found in concretions.

Consistence, soil. The feel of the soil and the ease with which a lump can be crushed by the fingers. Terms commonly used to describe consistence are—

Loose.—Noncoherent when dry or moist; does not hold together in a mass.

Friable.—When moist, crushes easily under gentle pressure between thumb and forefinger and can be pressed together into a lump.

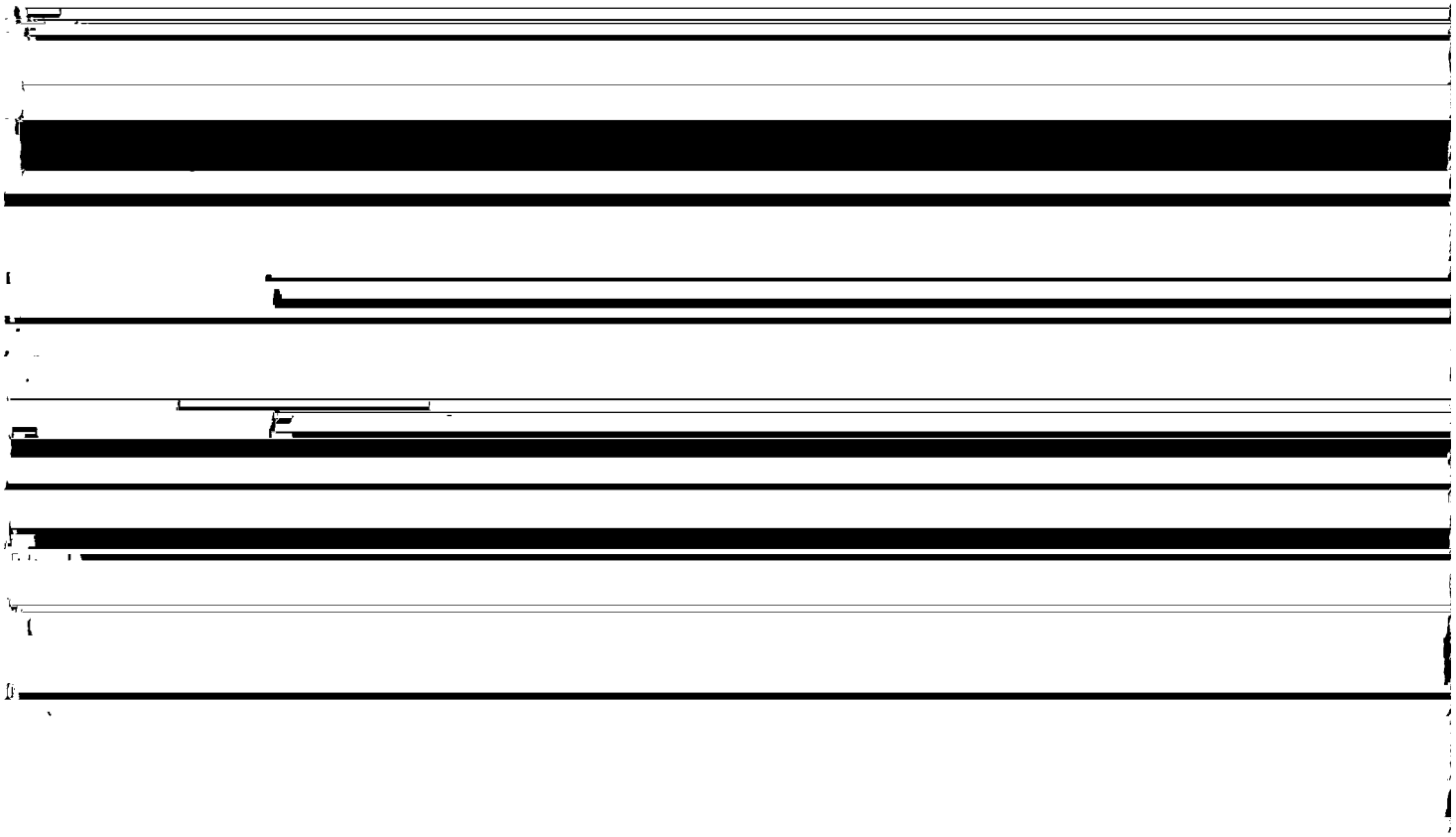
Firm.—When moist, crushes under moderate pressure between thumb and forefinger, but resistance is distinctly noticeable.

Plastic.—When wet, readily deformed by moderate pressure but can be pressed into a lump; will form a "wire" when rolled between thumb and forefinger.

Sticky.—When wet, adheres to other material, and tends to stretch somewhat and pull apart, rather than to pull free from other material.

Hard.—When dry, moderately resistant to pressure; can be broken with difficulty between thumb and forefinger.

Soft.—When dry, breaks into powder or individual grains under very slight pressure.



Erosion. The wearing away of the land surface by wind (sandblast), running water, and other geological agents.

Flood plain. Nearly level land, consisting of stream sediments, that borders a stream and is subject to flooding unless protected artifically.

Fragipan. A loamy, brittle, subsurface horizon that is very low in organic-matter content and clay but is rich in silt or very fine sand. The layer is seemingly cemented. When dry, it is hard or very hard and has a high bulk density in comparison with the horizon or horizons above it. When moist, the fragipan tends to rupture suddenly if pressure is applied, rather than to deform slowly. The layer is generally mottled, is slowly or very slowly permeable to water, and has few or many bleached fracture planes that form polygons. Fragipans are a few inches to several feet thick; they generally occur below the B horizon, 15 to 40 inches below the surface.

Glacial outwash (geology). Gravel, sand, and silt deposited by glacial meltwater.

nent. The size measurements are these: *fine,* less than 5 millimeters (about 0.2 inch) in diameter along the greatest dimension; *medium,* ranging from 5 millimeters to 15 millimeters (about 0.2 to 0.6 inch) in diameter along the greatest dimension; and *coarse;* more than 15 millimeters (about 0.6 inch) in diameter along the greatest dimension.

Organic matter. A general term for plant and animal material, in or on the soil, in all stages of decomposition. Readily decomposed organic matter is often distinguished from the more stable forms that are past the stage of rapid decomposition.

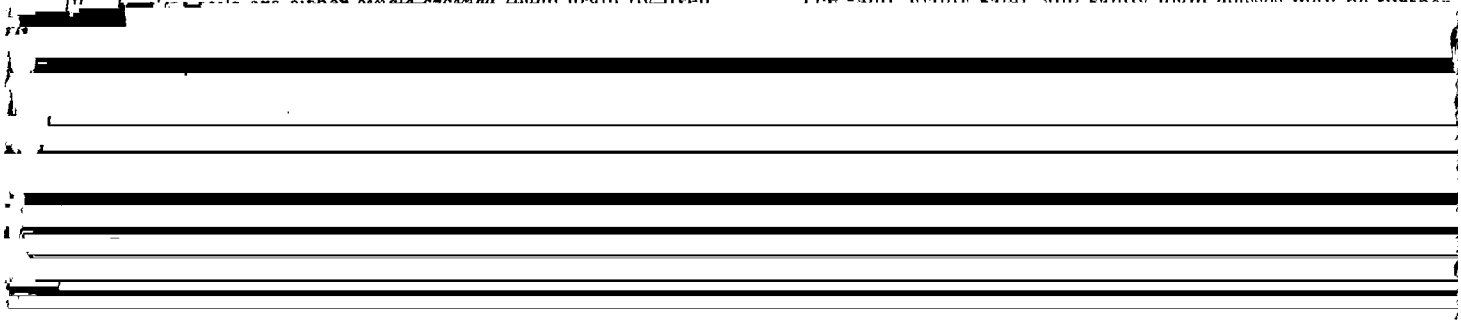
Parent material. Disintegrated and partly weathered rock from which soil has formed.

Ped. An individual natural soil aggregate, such as a crumb, a prism, or a block, in contrast to a clod.

Permeability. The quality of a soil horizon that enables water or air to move through it. It is commonly expressed as inches per

of aggregates longer than horizontal), *columnar* (prisms with rounded tops), *blocky* (angular or subangular), and *granular*. [redacted] soils are either *single-grained* (each grain by itself

sand, sandy loam, loam, silt loam, silt, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay, and *clay*. The sand, loamy sand, and sandy loam classes may be further



GUIDE TO MAPPING UNITS

For complete information about a mapping unit, read both the description of the mapping unit and the description of the soil series to which the mapping unit belongs. The system of woodland suitability grouping is explained in the section "Use of the Soils for Woodland."

Map symbol	Mapping unit	Page	Capability unit		Woodland suitability group
			Symbol	Page	Symbol
Ag	Algiers silt loam	103	IIw-1	10	2w1
AtB	Atlas silt loam, 2 to 6 percent slopes	104	IIIw-2	12	2w2
AtB2	Atlas silt loam, 2 to 6 percent slopes, moderately eroded	104	IIIw-2	12	2w2
AtC2	Atlas silt loam, 6 to 12 percent slopes, moderately eroded	104	IVe-3	13	2w2
AtC3	Atlas silt loam, 6 to 12 percent slopes, severely eroded	104	IVe-3	13	2w2
AvA	Avonburg silt loam, 0 to 2 percent slopes	106	IIIw-1	12	2w2
AvB	Avonburg silt loam, 2 to 6 percent slopes	106	IIIw-2	12	2w2
AxA	Avonburg-Urban land complex, nearly level	106	Not assigned	--	Not assigned
BeC2	Beasley silt loam, 6 to 12 percent slopes, moderately eroded	107	IVe-3	13	3c1
BeD2	Beasley silt loam, 12 to 18 percent slopes, moderately				

Map symbol	Mapping unit	Page	Capability unit		Woodland suitability group
			Symbol	Page	Symbol
GxD3	Guernsey soils, 12 to 18 percent slopes, severely eroded	137	VIe-2	14	2w3
HbA	Haubstadt silt loam, 0 to 2 percent slopes	138	IIw-3	10	2o1
HbB	Haubstadt silt loam, 2 to 6 percent slopes	138	IIe-2	9	2o1
HbC2	Haubstadt silt loam, 6 to 12 percent slopes, moderately eroded	138	IIIe-2	11	2o1
HbC3	Haubstadt silt loam, 6 to 12 percent slopes, severely eroded	138	IVe-2	13	2o1
HbD2	Haubstadt silt loam, 12 to 18 percent slopes				

GUIDE TO MAPPING UNITS--Continued

Map symbol	Mapping unit	Page	Capability unit		Woodland suitability group
			Symbol	Page	Symbol
LpE2	Loudon-Edenton silt loams, 18 to 25 percent slopes, moderately eroded	149	VIe-2	14	3r1
MdB	Markland silt loam, 2 to 6 percent slopes	150	IIIe-3	11	2o1
MdC2	Markland silt loam, 6 to 12 percent slopes, moderately eroded	150	IVe-3	13	2o1
MdD2	Markland silt loam, 12 to 18 percent slopes, moderately eroded	150	VIe-1	14	2r1
MgB	McGary silt loam, 0 to 4 percent slopes	151	IIIw-2	12	3w1
MlB	Miamian silt loam, 2 to 6 percent slopes	152	IIe-1	9	2o1
MlB2	Miamian silt loam, 2 to 6 percent slopes, moderately eroded	152	IIe-1	9	2o1
MlC2	Miamian silt loam, 6 to 12 percent slopes, moderately eroded	152	IIIe-1	11	2o1
MlD2	Miamian silt loam, 12 to 18 percent slopes, moderately eroded	152	IVe-1	13	2r1
MlE	Miamian silt loam, 18 to 25 percent slopes	152	VIe-1	14	2r1
MmC3	Miamian clay loam, 6 to 12 percent slopes, severely eroded	152	IVe-1	13	2o1
MrB	Miamian-Russell silt loams, 2 to 6 percent slopes	152	IIe-1	9	2o1
MrB2	Miamian-Russell silt loams, 2 to 6 percent slopes, moderately eroded	153	IIe-1	9	2o1
MrC2	Miamian-Russell silt loams, 6 to 12 percent slopes, moderately eroded	153	IIIe-1	11	2o1
MsB	Miamian-Urban land complex, gently sloping	153	Not assigned	--	Not assigned
Mt	Millsdale silty clay loam	154	IIIw-3	12	2w1
MuB	Milton silt loam, 2 to 6 percent slopes	155	IIe-1	9	2o1
MuB2	Milton silt loam, 2 to 6 percent slopes, moderately eroded	155	IIe-1	9	2o1
MuC2	Milton silt loam, 6 to 12 percent slopes, moderately eroded	155	IIIe-1	11	2o1
MuD2	Milton silt loam, 12 to 18 percent slopes, moderately eroded	155	IVe-3	13	2r1
MwC3	Milton clay loam, 6 to 12 percent slopes, severely eroded	155	IVe-3	13	2o1
My	Montgomery silty clay loam	156	IIIw-3	12	2w1
NdC	Negley loam, 6 to 12 percent slopes	159	IIIe-4	11	2o1
NdD	Negley loam, 12 to 18 percent slopes	159	IVe-4	13	2r1
NdE	Negley loam, 18 to 25 percent slopes	159	VIe-1	14	2r1
NdF	Negley loam, 25 to 35 percent slopes	159	VIIe-1	15	2r1
NeB	Negley silt loam, 2 to 6 percent slopes	159	IIe-3	9	2o1
NfC3	Negley clay loam, 6 to 12 percent slopes, severely eroded	160	IVe-4	13	2o1
NfD3	Negley clay loam, 12 to 18 percent slopes, severely eroded	160	VIe-1	14	2r1
NgF	Negley-Fox complex, 18 to 35 percent slopes	160	VIe-1	14	2r1
NnB	Nicholson silt loam, 2 to 6 percent slopes	162	IIe-2	9	2o1
NnB2	Nicholson silt loam, 2 to 6 percent slopes, moderately eroded	162	IIe-2	9	2o1
NnC2	Nicholson silt loam, 6 to 12 percent slopes, moderately eroded	162	IIIe-2	11	2o1
OcA	Ockley silt loam, 0 to 2 percent slopes	163	I-1	9	1o1
OcB	Ockley silt loam, 2 to 6 percent slopes	163	IIe-1	9	1o1
OcC2	Ockley silt loam, 6 to 12 percent slopes, moderately eroded	164	IIIe-1	11	1o1
OdB	Ockley-Urban land complex, gently sloping	164	Not assigned	--	Not assigned
OpD2	Opequon silt loam, 6 to 18 percent slopes, moderately eroded	165	IVe-3	13	3x1

GUIDE TO MAPPING UNITS--Continued

Map		Capability unit	Woodland suitability group
[redacted]			

GUIDE TO MAPPING UNITS--Continued

Map symbol	Mapping unit	Page	Capability unit		Woodland suitability group
			Symbol	Page	Symbol
Ws	Westland silt loam, overwash	186	IIw-4	10	2w1
Wt	Westland silty clay loam	186	IIw-4	10	2w1
WvA	Williamsburg silt loam, 0 to 2 percent slopes	188	I-1	9	1o1
WvB	Williamsburg silt loam, 2 to 6 percent slopes	188	IIe-1	9	1o1
WvC	Williamsburg silt loam, 6 to 12 percent slopes	188	IIIe-1	11	1o1
XeB	Xenia silt loam, 2 to 6 percent slopes	189	IIe-1	9	1o1

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